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Master's thesis in Veterinary Medicine

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# Dog owners' perceptions of dog behavior and the emotional state of the dog during animal-assisted activities



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## **Title Page**

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## **Preface**

This master thesis was written as part of the MSc in Veterinary Medicine at the Faculty of Health and Medical Sciences, University of Copenhagen. The thesis is directed for people involved with research and working on the field of human-animal interaction, animal-assisted interventions and dog behavior.

I would like to tell briefly why I chose this topic for my thesis. I came across the terms human-animal interaction, anthrozoology and green care out of my own curiosity a couple of years ago. I never was directly introduced to these subjects during my study or through other channels. As communicating with animals have always been very natural and essential part of my life, I became fascinated about looking at human-animal interaction from a scientific point of view. Especially animal-assisted interventions got my attention, because I see it as a great opportunity for many people to spend some time with animals who might not otherwise have a possibility for it. At the same time I am concerned how animals are experiencing animal-assisted interventions. These wonderings, thoughts and reasoning were foundation for my thesis.

I am honored to have had three inspiring supervisors: Helle Halkjær Kristensen, Karen Thodberg and Iben Coakley Mayer. First of all, I am grateful that you could see the insight of my thoughts for the thesis when I first contacted you. Through the research process I have received structured suggestions and advices, as well as freedom to make my own decisions. I am thankful for your encouragements and coaching in times I needed it. Furthermore, I truly appreciate for your great effort and time you have invested to my thesis.

I am thankful for the dog owners for many memorable moments and letting me be a part of the wonderful and valuable work you are doing with your beloved team-mates, your dogs. I especially would like to thank Maarit Haapasaari for trusting me, and for many interesting discussions.

I could have never completed this thesis and veterinary medicine education without support from my friends and family.

My dear sister, Sari, I cannot describe how important you are in my life. Thank you for listening, giving feedback, and sharing the wonderful and sorrowful moments – especially during the past year.

Shyam, my son, you are the drive and the inspiration for me in everything I do. You have been patiently travelling with me around Scandinavia for meeting researchers and conducting my thesis. You were the best assistant (filming dogs) I could ever wish for. I wish my journey to reach dreams, this thesis and becoming a veterinarian, will inspire you someday.

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Heidi Hotti

11<sup>th</sup> of October 2013

## **Abstract**

The aim of this study was to investigate dog owners' observations of dog behaviors and emotions of dogs during animal-assisted activities (AAA).

The investigations were carried out by video-recording the behavior of 11 dogs for ten minutes in the start of AAA visits at nursing homes. During that time the owners also made their observations of the behaviors and emotions of their dogs, which they documented in the questionnaires immediately after the observation period of ten minutes. A total of 38 video-recordings and questionnaires were included into the statistical analyses.

Firstly, the relationship between the owners' evaluations of dog behavior and the actual behavior registered from the video-recordings was measured. Study revealed that there was a positive relationship between following behaviors: yawning, panting, tail wagging, standing, sitting and lying down. Secondly, the relationship between the actual dog behavior and the owners' evaluations of the emotions the dogs experienced during the visit was measured. Thirdly, the relationship between the owners' evaluations of dog behavior and the owners' evaluations of the dogs' emotions was measured. The behaviors and emotions were associated correctly into some extent. The behaviors, panting, tail wagging, standing and sitting, were associated constantly with the emotions for the second and third relationship. Panting, tail wagging and standing were associated with positive emotional state, whereas, sitting was associated with a negative emotional state.

Based on the results, it is suggested that the organizations involved with AAI should provide guidance and information regarding dog behavior for dog owners. The long term consequences of this study would be promoting owner-dog interaction in animal-assisted interactions (AAI).

## **Tiivistelmä**

Tutkimuksen tavoitteena oli tutkia koiran omistajien arvioita koiran käyttäytymisestä ja koiran tunteista eläinavusteisen toiminnan aikana.

Tutkimus suoritettiin siten että 11 koiraa videokuvattiin kymmenen minuuttia eläinavusteisen toiminnan aikana vanhainkodeissa sekä palvelutaloissa. Koirien omistajat arvioivat koiriensa käyttäytymistä ja koirien tunteita tuon kymmenen minuutin aikana, sekä dokumentoivat ne kyselylomakkeille heti kuvauksen loputtua. Tutkimuksessa käytettiin kaikkiaan 38 videota ja kyselylomaketta.

Ensimmäiseksi, omistajien arviointeja koirien käyttäytymisestä suhteeseen videolta mitattujen koirien käyttäytymistä vertailtiin toisiinsa. Arvioista seuraavat käyttäytymiset olivat yhdenmukaisia mittauksen kanssa: haukottelu, läähättäminen, hännän heilutus, seisominen, istuminen ja makaaminen. Toiseksi, koirien käyttäytymistä videolta ja omistajien arviointeja koirien tunteista vertailtiin toisiinsa. Kolmanneksi, omistajien arviointeja koirien käyttäytymisestä ja omistajien arviointeja koirien tunteista verrattiin toisiinsa. Omistajat olivat arvioineet koirien käyttäytymistä ja tunteita osittain johdonmukaisesti. Koirien käyttäytymisestä hännän heilutus, läähättäminen, seisominen ja istuminen olivat yhdenmukaisia omistajien arviointien kanssa koskien koirien tunteita. Hännän heilutus, läähättäminen ja seisominen liittyivät positiivisiin tunteisiin, kun taas istuminen liittyi negatiivisiin tunteisiin.

Tutkimuksen tuloksiin perustuen, olisi suositeltavaa että järjestöt jotka tarjoavat eläinavusteista toimintaa ohjaisivat ja välittäisivät tietoa koirien käyttäytymisestä koirien omistajille. Tämä osaltaan edistäisi omistajien ja koirien välistä kommunikaatiota pitkällä tähtäimellä eläinavusteisen toiminnan aikana.

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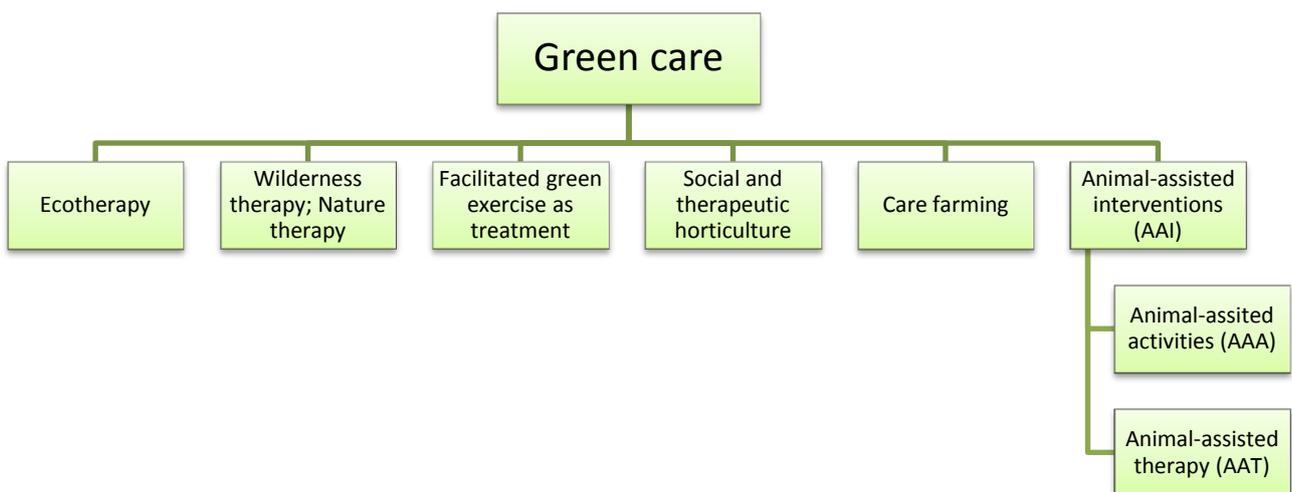
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# 1. INTRODUCTION

## 1.1 Animal-assisted interventions (AAI)

Animal-assisted intervention is one of the branches in the green care, which is an overall term covering different activities involving nature and animals in order to produce health, social and educational benefits (fig. 1.1) (Sempik, et al., 2010). Animal-assisted intervention (AAI) is defined as “any intervention that intentionally includes or incorporates animals as part of a therapeutic or ameliorative process or milieu” (Kruger and Serpell, 2010). AAI includes both animal-assisted activities (AAA) and animal-assisted therapy (AAT). Pet Partners (2012) defines AAA as “provides opportunities for motivational, educational, recreational, and/or therapeutic benefits to enhance quality of life”, and AAT as “a goal-directed intervention in which an animal that meets specific criteria is an integral part of the treatment process.”



**Figure 1.1. Green care is an overall term for six different activities involving nature and animals. AAI is further divided into AAA and AAI. Figure is modified from the original illustration (Sempik, et al., 2010).**

## 1.2 Human-animal bond (HAB)

A definition of American Veterinary Medical Association (2012) for the human-animal bond is “a mutually beneficial and dynamic relationship between people and animals that is influenced by behaviors that are essential to the health and well-being of both. This includes, but is not limited to, emotional, psychological, and physical interactions of people, animals, and the environment.” Russow (2002) suggested earlier that HAB involves a relationship between a human and an

individual animal, HAB is reciprocal and persistent, and HAB tends to promote an increase in wellbeing for both parties. Dog owners themselves had described their relationship with their dogs as “you’ve got to get know your dog, respect, two-way communication, a relationship built on trust, partnership, and learning” (Kuhl, 2011). Opposite to the above mentioned definition, suggestions and description of HAB being mutual, reciprocal and a two-way communication, Bayne (2002) argues that the bond can be also unidirectional. For instance, a person working in animal research facilities may become particularly attached to an animal that shows no special regard for that individual.

### **1.3 Effects of AAI and HAB in humans**

There are two main perspectives explaining how and why animal-assisted interactions potentially can be therapeutic. Firstly, merely the presence and interaction with an animal itself during therapy sessions is suggested to reduce anxiety and stress, animals can be social mediators and transitional objects while absence of an attachment figure (Kruger and Serpell, 2010). Second perspective is based on cognitive and role theory where animals can be involved as living, interactive tools to help people (Kruger and Serpell, 2010).

The theoretical framework for HAB is based on the attachment theory, developed by Bowlby (1970) (Fine and Beck, 2010). The attachment theory, explains the importance of the attachment between parents and offspring and it has been suggested that the human/pet relationship can be often paralleled with the human/human relationships, especially that of child and parent (Barba, 1995; Prato-Previde, et al., 2003). Companion animals can be also a resource for social support for people and act as buffer for stress (Fine and Beck, 2010).

Studies have demonstrated that HAB and AAI can affect human lives socially and mentally in many ways throughout the lifespan (Teoh, et al., 2004; Beck and Madresh, 2008). It appeared that pets are source of attachment (Beck and Madresh, 2008). Pets, especially cats and dogs, can reduce feeling of loneliness and be comforting in diverse stressful transitions in life (Teoh, et al., 2004). AAT has shown to enhance socializing, reinforcing activities in daily living and general well-being in the lives of elderly schizophrenic patients (Barak, et al., 2001).

An ownership of a pet or an interaction with animals can affect human lives also physically. Owners of the pet had a greater survival after one year discharge from the coronary care unit (Friedmann, et al., 1980). The ownership of a dog encourages exercising and thereby has a positive

effect on human life (Thorpe, et al., 2006). However, Straatman et al. (1997) concluded that presence of unfamiliar dog under stressful situation did not have significant psychological and cardiovascular effect on students. Also positive interaction between humans and dogs can decrease blood pressure and increase in variety of hormones and neurotransmitters improving well-being for both humans and dogs (Odendaal and Lehmann, 2000; Odendaal and Meintjes, 2003).

#### **1.4 Evaluation of dog welfare in AAI**

Animal welfare includes the physical and mental states of animals, which are described as freedom from thirst, hunger, malnutrition, discomfort, pain, fear, distress and restricted behavioral expressions (Farm Animal Welfare Committee, 2011). Furthermore, it has been discussed that animal welfare extends beyond animals' biological and physiological needs. An important aspect of welfare is what the animal itself experiences. This means that good animal welfare among other indicators, consists of the presence of positive and absence of negative emotions (Mellor, 2013).

Different approaches have been used to evaluate how the dogs experience AAI. Behavior has been combined with physiological reactions (saliva cortisol and heart rate) in two studies. King et al. (2011) used behavior observation and saliva cortisol measurement as indicators for assessing level of stress in therapy dogs. It was noted that the dogs identified as positive for stress had also more behavioral signs of stress. Further, dogs over six-years-old and experienced dogs showed a trend of less behavioral signs of stress than younger and less experienced dogs. Behavior has been used as an indicator for welfare in therapy dogs combined with heart rate measures (Chereno Hendriksen, 2012). Correlations between heart rate and behavioral responses were not found. Additionally, fear and aggressiveness in dogs were not observed and escape was observed only few times.

Haubenhofner and Kirchengast (2007) studied dog handlers' and dogs' emotional states and cortisol level associated with AAI sessions. Saliva cortisol was measured from both dogs and dog-handlers. Questionnaire was for dog handlers to evaluate their own and dogs' emotional states before, during and after AAI. Dog handlers perceived that their dogs' experienced both negative and positive emotions during the therapeutic work.

Physiological reaction (saliva cortisol) measurement has been used to evaluate stress level in dogs during AAI. Haubenhofner and Kirchengast (2006; 2007) showed that dogs had increased cortisol concentrations on days with AAI sessions compared with control days, and cortisol concentration increased with the number of sessions per week. Cortisol concentrations were also higher in short

sessions (Haubehofer and Kirchengast, 2006). Dogs had higher cortisol concentrations after AAI when sessions took place before 2.00p.m., while cortisol concentrations decreased after sessions which took place after 2.00 p.m. (Haubehofer and Kirchengast, 2006). Results regarding cortisol and sessions hold before noon/afternoon could not be explained in the study, and were speculated if the results could be due to true physiological variation in the cortisol level in dogs. Opposite to the other studies, Glenk et al. (2013) concluded that the dogs were not stressed by AAI, but cortisol level varied during AAI between dogs on- and off-leash.

These studies, excluding Glenk et al. (2013), indicate that therapeutic work is physiologically arousing for the dogs. And it has been suggested that animal welfare in AAI needs to be investigated more in order to ensure the welfare of the animals and promote interactions between animals and humans (Iannuzzi and Rowan, 1991; Beck and Katcher, 2003).

### **1.5 Perception and interpretation of dog behavior by people with varied experience with dogs**

The dog owners/handlers are the ones that are ensuring the dog welfare during the AAI, and therefore they should be able to interpret the behavior of their dog correctly during the AAI.

Perceptions of different dog behaviors and interpretations of behaviors have been studied previously. Subtle signs of stress such as looking elsewhere, turning head, yawning and nose licking were rarely reported by dog owners, whereas trembling and whining were the most frequently chosen to indicate stress in dogs (Mariti, et al., 2012). Dog owners mostly reported vocalization and gross body movements when describing the dog behavior in different situations and emotional states (Kerswell, et al., 2009). People with different experience with dogs reported facial features (eyes, ears, mouth/tongue) more likely indicating fear in dogs, while the bodily features (legs/paw, tail) were reported indicating the emotion happy in dogs (Wan, et al., 2012). Tail movement was the most frequently used cue to interpret dog behavior and it was followed by muzzle-related cues and large body movements (Tami and Gallagher, 2009).

How the level of experience with dogs affect interpreting dog behavior has been studied. The number of physical features which informed dog's emotional state increased with former experience with dogs (Wan et al., 2012). The same study concluded that identification of a fearful emotional state in dogs increased with experience, while identification of happy emotional state varied little by experience. Inexperienced people were better at identifying anger in the dog's facial expressions than experienced people (Bloom and Friedman, 2013). Otherwise the difference between

experienced and inexperienced people was little, when interpreting the dog's facial expressions correctly (Bloom and Friedman, 2013). Tami et al. (2009) concluded that ability to interpret the dog behavior did not vary between experienced and inexperienced people.

These results are implying that it can be challenging to observe dog behavior and interpret it correctly.

### **1.6 Objective and Hypotheses of the study**

The purpose of this study was to investigate dog owners' observations of dog behaviors and dog's emotions during AAA. Long term objective would be improving owner-dog communication in AAI and thereby improve dog welfare.

Three hypotheses were posed to reveal the owners' observations and interpretations of dog behavior.

H1: There is a relationship between the owner's estimate (on a Visual Analogue Scale (VAS)) of each 16 behaviors and the occurrence of these behaviors, based on video-observations of the dogs during an AAA session/visit.

H2: There is a relationship between how the owners interpret their dog's emotional state during a visit (on a VAS of 10 emotions) and the behavior of the dog (based on video-observations).

H3: There is a relationship between the owner's estimate (on a VAS) of each 16 behaviors and how the owners interpret their dog's emotional state during a visit (on a VAS of 10 emotions).

## **2. MATERIALS AND METHODS**

### **2.1 Participants and the visited institutions**

The researcher contacted one of the founders of the organization involved with AAA, Finnish Furry Friends (Suomen Karva-Kaverit), to inquire if there were dog owners interested in participating in the study. Eight dog owners responded and were interested to take a part of the study with their 12 dogs. The dog owner teams are members of the organization. For arranging the visiting schedules, the dog owners were contacted individually by email. This type of sampling method is called convenience sampling (Toft, et al., 2004).

Visits took place in three nursing homes (Simonkoti, Hoivakoti Hopea and Runosmäki) and in two assisted living buildings for elderly (Värttina and Paltanpuisto) and in residency for people with an intellectual disability (Neliapila). The complete list of dates and institutions visited is shown in table 3, Appendix 2. These institutions are located in the southern Finland. The dog owner teams who participated in the study are regularly visiting these institutions and therefore it was most practical to include these institutions into the study. The organization arranges visiting times with institutions, and afterwards the dog owner teams can sign up for visits. The teams usually are visiting same institutions weekly or monthly or however they have agreed. It is also possible that a dog owner by herself contacts a specific institution and they make an agreement. The organization has a policy that all the dogs have to be on-leash during visits, but the dogs are in a long leash and therefore are able to move around quite freely most of the times. Often many dog owner teams are attending at the same visit. Mostly visits occur in common rooms where residents are spending time together. It was chosen that observations in this study occurred only in common rooms with group of residencies interacting with dog owners teams, because different types of visits (group vs. individual) may have impact on the dog behavior.

## **2.2 Procedure**

The dog owners received questionnaires and the procedure for the video-recordings by email. The owners had a possibility to read through the questionnaires before the first recordings. By this way the owners were prepared for the first visit. A pilot visit was conducted on 13<sup>th</sup> of March, 2013. And 43 recordings were conducted between 14<sup>th</sup> of March and 13<sup>th</sup> of April. The researcher met the dog owner teams before the visit start. The interaction with the dog took place in a common room with a group of people, and two dogs also visited residents individually in their rooms. Dogs had 5-10 minutes to get used to the place and possibly greet other dogs in the beginning of the visit. The video-recording was started after the dog calmed down. 10 minutes was recorded. If there were two dog owner teams, who were participating the study, recording of both dogs were conducted by the researcher and an assistant using separate cameras for filming different dogs. Right after the recording the owner filled the questionnaires. The dog owner team continued the rest of the visit as usual.

## **2.3 Behavioral observations of the dogs during AAA**

An ethogram consists of 10 events and 6 states (table 2.1). Behaviors were selected based on previous studies. Continuous recording was used to register behaviors. Continuous recording is also

called all-occurrences recording, which aims to measure true frequencies and durations of behaviors, and the times at which behavior pattern started and stopped (states) or behavior occurred (events) (Martin and Bateson, 2007). Pattern of the behaviors were not recorded in this study, because it was not relevant with regarding aim of the study.

10 minutes were recorded for each of the 43 visits. Time of ten minutes was used in the previous study (Chereno Hendriksen, 2012). Recording ten minutes were reasoned to be suitable for this study, taken into consideration that continuous recording is demanding (Martin and Bateson, 2007). A video camera (Sony HDR-CX220) was used for recording. Observations made from the video-recordings were transcribed into quantitative measurements by using a check sheet by hand.

**Table 2.1. Ethogram. It is possible to record several behaviors simultaneously. F = frequency; D = duration**

Motivation	Behavior	Type	Description of behavior
Escape behavior	Walking away	F	Walking away from all visitees <sup>1</sup> and the situation.
Displacement behavior	Snout licking	F	The tongue extends upwards to cover nose, and/or tongue moves along the upper lip.
	Yawning	F	The jaws open wide for a few seconds and then close.
	Body shaking	F	Shaking a part of the body or whole body.
	Panting	D	An increased frequency of inhalation and exhalation with open mouth and tongue extended.
	Looking at the owner <sup>2</sup>	F	Visual contact of the dog with the owner <sup>3</sup> . A period of 1-3s is counted as an event.
Contact seeking behavior	Pushing the snout	F	Pressing the snout against the visatee.
	Pawing	F	Lifting the front paw and aiming to reach the visatee.
	Approaching	F	Approaching the visatee by walking towards or changing the body posture to orient towards the visatee.
	Tail wagging	F	A relaxed mid-position tail wagging. A bout of three tail wagging is counted as an event.
	Bodily contact	D	Standing/sitting/lying within 10cm of the visatee.
Posture	Standing	D	The dog is standing.
	Sitting	D	The dog is sitting.
	Lying down	D	The dog is lying down on the side or breast or on the back.
	Active	D	The dog is moving around.
Human manipulation	Control from the owner	F	The owner corrects dog's position or posture by voice, giving a treat, or through physical modulation of the dog.

<sup>1</sup> A visatee can be a resident in a retirement home/a residency for people with intellectual disability, or personnel.

<sup>2</sup> Looking at the owner can be indicating insecurity, reassurance or begging for more treats. This behavior is reasoned further in the Discussions.

<sup>3</sup> The owner of the dog.

## 2.4 Questionnaires

The questionnaires for the dog owners consisted of three parts. The part A was filled only once. Parts B and C were always presented in the same order. The complete questionnaires are attached in the Appendix 1.

### *General information, part A*

Part A had general information about the dog owner including: age, gender and experience with dogs, and experience of being involved with animal assisted activities. The experience with dogs was categorized further. Also general information about the dog was requested: age, breed, gender, neutered, and experience of being a visiting dog. Because of the small sample size, it was not able to categorize dog owners or dogs by experience in AAA.

### *Detecting behavior, part B*

Visual analogue scale (VAS) was used for detecting the observed behaviors of the dog by the owner during the period of 10 minutes of animal-assisted activities in the beginning of the visit. Behaviors are the same than described in the ethogram. The owners could mark on VAS how they perceived the occurrence of diverse behaviors in dogs. Visual analogue scale have been used to rate the pain in dogs (Ellingsen, et al., 2010), and it was used for dog owners to assess their dog behavior and health outputs (Mullan and Main, 2007). Simple Visual Analogue Scale was chosen for the present study. A simple VAS is a line from 0 mm to 100 mm and the ends are defined as the extreme limits of the parameter (Paul-Dauphin, et al., 1999). The minimum limit for this study was ‘Not at all’ and the maximum was ‘Very often’. All the questions are asked the same way, and the extreme limits are also the same for all the questions.

### *Interpreting behavior, part C*

The last part of the questionnaire was for the owners of the dogs to assess emotional states of their dogs during the period of 10 minutes of animal-assisted activities. VAS was used also in this part. Five positive and five negative emotions were included. The extreme limits were: “Not at all – Very much”. Words to assess dog’s emotions are from the previous study (Haubenhofer and Kirchengast, 2007), and were modified to suit this study.

Translations of emotions into Finnish are in the brackets:

The positive emotions were: Joyful (hyväntuulinen/iloinen), Relaxed (rento), Satisfied (tyytyväinen), Calm (rauhallinen), and Pleasant (mukava).

The negative emotions were: Strained (rasittunut), Stressed (stressaantunut), Irritated (ärsyyntynyt), Tired (väsynyt), and Nervous (hermostunut).

## **2.5 Ethical considerations**

Permissions for video-recordings were applied directly from the institutions where observations were conducted. Further permissions were not needed, since it had been agreed that the focus on the video-recordings were in the dogs. The situations were recorded so that the faces of residents and personnel were not showing in the video-recordings and thereby could not be identified. Visits themselves followed guidelines of organization regarding dogs and dog owners.

## **2.6 Statistical analyses**

The descriptive analysis was carried out using Excel. Median, Q1 and Q3 were calculated for the behaviors and the emotions. The data was analyzed further with SAS 9.3 (SAS Institute Inc.). The non-parametric Spearman's correlation coefficients were calculated to find out the level of the relationship between the owners' assessments of dog behavior and actual dog behavior; the owners' assessments of dogs' emotions and actual dog behavior; the owners' assessments of dog behavior and the owners' assessments of dogs' emotions. Visits from 1 to 4 were pooled together and overall correlations were used.

# **3. RESULTS**

## **3.1 Descriptive analysis**

### **3.1.1 The dog owner teams**

Eight dog owners and twelve dogs participated in this study. Data about the dogs and dog owners are presented in the tables 1 and 2 in the Appendix 2. One person owned three dogs, two persons owned two dogs and five persons owned one dog. All the dog owners were females, ages ranged between 23 and 70 years with a mean age of 44,38 (SD=12,89). Six owners had have dog/dogs before and one of them worked professionally with dogs. Two owners were first time dog owners and one of them worked professionally with dogs. The owners' experience in voluntary based animal-assisted activities (AAA) ranged from 8 months to 10 years (mean=3,92 years and SD=3,46

years). The owners made visits with their dog/dogs from 2 to 9 times (mean=3,75 and SD=2,25) in a month. One owner also worked professionally with her dogs daily providing AAA for several institutes.

Dogs of different breeds were used in study: seven Bernese Mountain dogs, two Chinese Crested dogs, one Scotch Collie, one Cocker Spaniel, and one Tibetan Spaniel. Five of the dogs were females and three were males and two of the males were neutered. Ages of the dogs ranged from 1 to 7 years with a mean age 2,62 years (SD=2,00). The dogs' experience of being a visit-dog varied from 7 months to 7 years (mean=2,08 years and SD=1,92 years), and from 2 to 4 visits (mean=3,67 and SD=1,83) in a month. Additionally to voluntary based AAA, three dogs worked daily with their owner professionally.

Video-recordings consisted of 43 clips each lasting 10 minutes. For each video-clip a questionnaire was filled out. Five visits were excluded, because the procedure during the visits differed from the others. A total of 38 video-recordings and questionnaires were included into the statistical analyses.

### **3.1.2 Occurrence of each behavior and emotion**

Some of the questions regarding dog behavior were unfortunately overseen by an owner on the second and third visit. The behavior 'active' was added to the ethogram in the middle of the empirical study. Therefore this behavior was assessed only by few owners. The part of the questionnaire evaluating dog's emotional state was otherwise fully completed, except the five negative emotions were overseen for the first visit (table 7 and 8 in the appendix 4).

Figure 3.1 shows dogs' behaviors measured from the video-recordings given as medians of the frequency of occurrences. Tail wagging was excluded from the figure 3.1 due to a much higher frequency level compared to the other behavior elements. Median for tail wagging was 33,5;  $Q_1$  was 20,  $Q_3$  was 64,75; minimum was 0 and maximum was 146. Behaviors which had the lowest medians were escape, body shaking, pushing snout and pawing, whereas approaching and tail wagging had highest medians. Figure 3.2 shows the owners' assessments of the behaviors. Tail wagging is included in the figure 3.2. The scale is VAS, which was used in the questionnaires. For owners assessments behaviors escape, snout licking, yawning and body shaking had lowest medians. Behaviors tail wagging and approaching had also highest medians in the owners' evaluations.

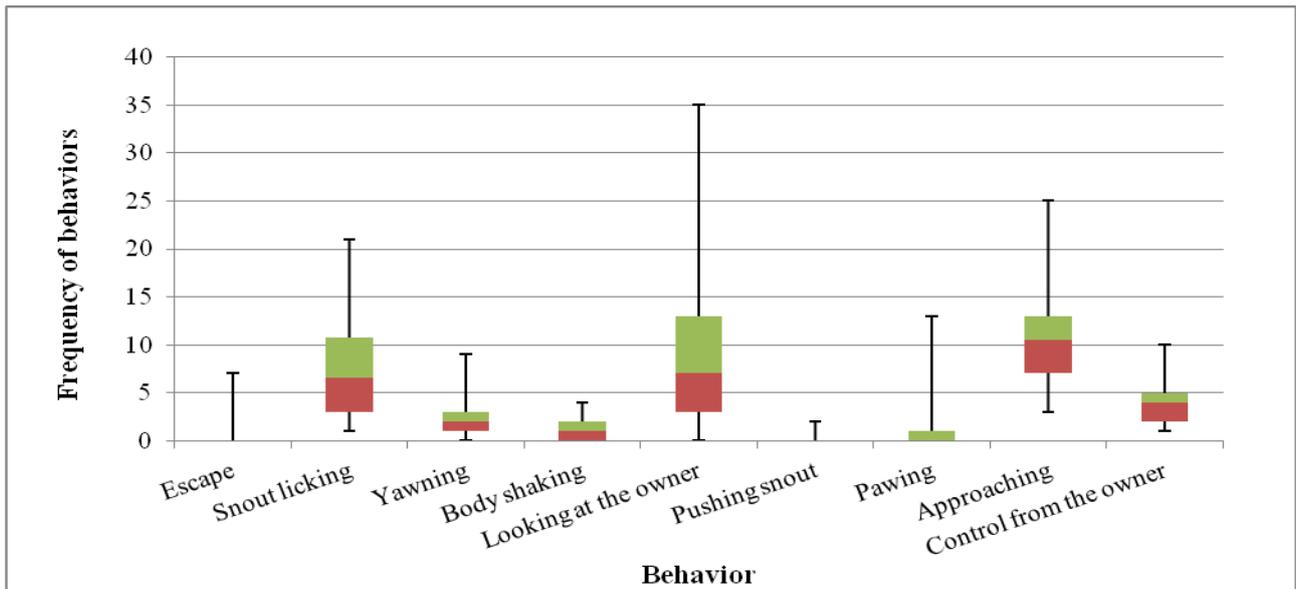


Figure 3.1. The level of occurrence of the behaviors. Green color is showing the third, and red color is showing the first quartile, the median is between these colors. The whiskers are showing minimum and maximum levels for occurrences of each behavior.

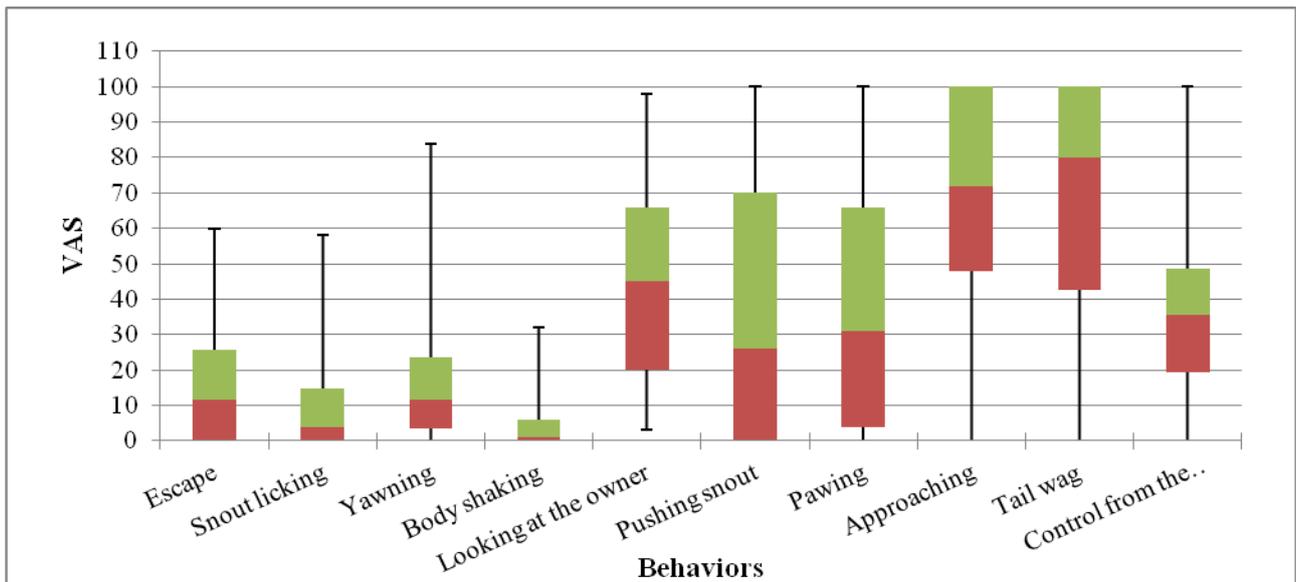


Figure 3.2. Owners' assessments of dog behavior. Y-axis is the Visual Analogue scale (VAS), where 0 (mm.) is representing 'not at all' and 100 (mm.) is standing for 'very much'.

Figure 3.3 presents six behaviors, which were measured as duration from the video-recordings. Behaviors sitting and lying down had lowest medians. Behaviors panting and bodily contact had highest medians. The owners' evaluations for behaviors are presented in the figure 3.4. The scale was VAS from the questionnaires. The same behaviors had lowest and highest medians for the owners' evaluations as it was for the behaviors measured from the video-recordings.

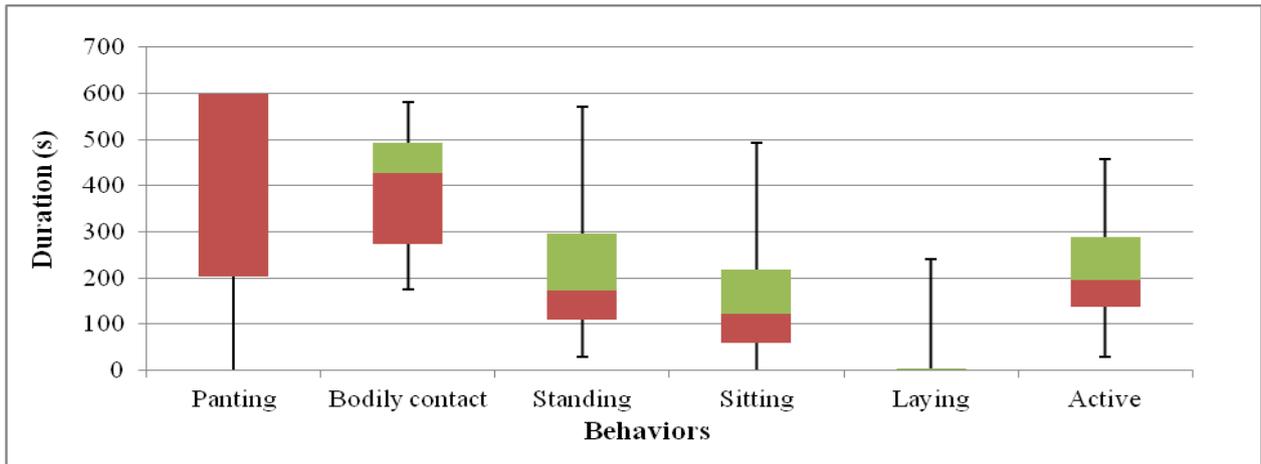


Figure 3.3. The level of the behaviors scored as duration (s) measured from the video-recordings.

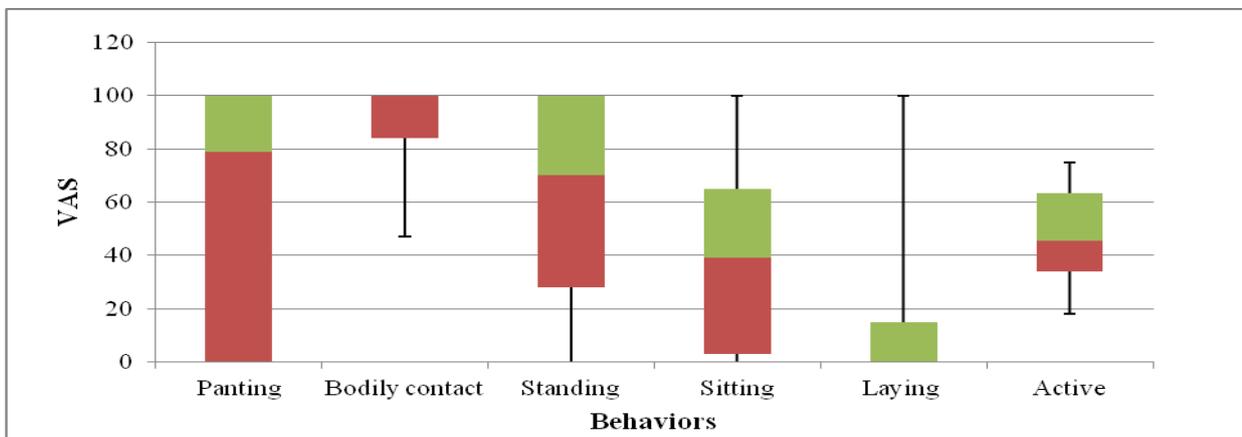


Figure 3.4. Owners' assessments of dog behavior.

The positive and negative emotions assessed by the owners are shown in the figure 3.5. The owners had assessed that their dogs experienced the visits mostly positively. Data for each dog are presented in the Appendix 3. Tables with median, Q<sub>1</sub>, Q<sub>3</sub>, minimum and maximum for figures from 3.1 to 3.5 are shown in the Appendix 5.

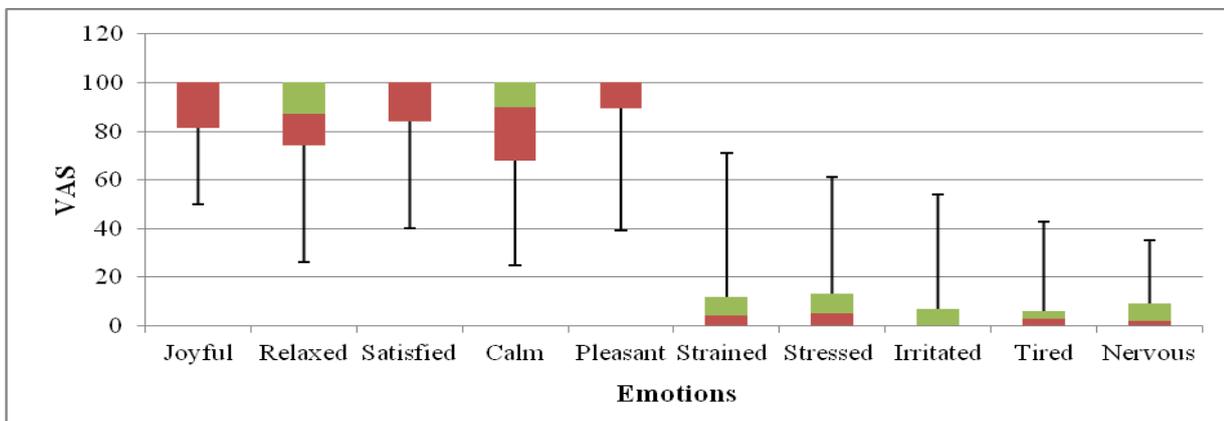


Figure 3.5. Owners' assessments of the positive and negative emotions of the dogs.

### 3.2 The relationship between the dog owners' assessments of dogs' behavior and the actual dog behavior measured from the video-recordings

Between the owners' evaluations of dog behaviors and actual dog behavior from video-recordings, three behaviors (panting, tail wagging and standing) were correlated over all four visits. Three behaviors (yawning, sitting and laying down) had overall correlation coefficient above 0.56, but one or two visits had correlation coefficients under 0.4. Some behaviors (body shaking, approaching, bodily contact, active and control from the owner) had correlation coefficient over 0.4 (negative/positive) for two or three visits, but overall correlation coefficients were less than 0.4. Behaviors (snout licking and pawing) were correlated less than 0.4 over all visits (table 3.1).

**Table 3.1. Spearman correlations ( $r_s$ ) for dog behaviors from the owners' assessments (VAS) and the observations from the video-recordings for each four visits, and pooled overall correlations. P-values for significant correlations ( $p < 0.05$ ;  $p < 0.001$ ;  $p < 0.0001$ ) are shown. The colors are visualizing the strength of the relationship; explanations are showed in the table 3.2.**

Behavior	Visit 1	Visit 2	Visit 3	Visit 4	Overall correlation
Escape <sup>4</sup>	0.056	0.2	0.45	0	0.24 (n=38)
Snout licking	0.29	0.35	-0.25	0.27	0.15 (n=38)
Yawning	0.7	0.24	0.29	0.9	0.56** (n=38)
Body shaking	0.49	0.5	0.21	0.073	0.36* (n=38)
Panting	0.53	0.55	0.75	0.71	0.64*** (n=38)
Looking at the owner	0.21	0.061	0.53	0.12	0.22 (n=37)
Pushing snout <sup>5</sup>	0.31	-0.41	0	0	-0.12 (n=37)
Pawing <sup>6</sup>	0	0.32	0.28	0	0.26 (n=37)
Tail wagging	0.41	0.96	0.83	0.54	0.75*** (n=36)
Approaching	-0.79	0.43	-0.099	-0.59	-0.16 (n=37)
Bodily contact	-0.52	-0.025	-0.7	0.034	-0.34* (n=37)
Standing	0.65	0.52	0.73	0.70	0.67*** (n=37)
Sitting	0.43	0.81	0.28	0.76	0.62*** (n=37)
Lying down	0.16	0.94	0.71	0.77	0.64*** (n=37)
Active <sup>7</sup>	-1	0.37	0.6	-1	0.37 (n=38)
Control from the owner	0.5	0.1	0.45	-0.44	0.27 (n=38)

<sup>4</sup> No escape behavior was observed from the video-recordings during the fourth visit. Therefore the correlation is zero.

<sup>5</sup> No behavior 'pushing snout' was observed from the video-recordings during the third and fourth visits. Therefore the correlations are zero.

<sup>6</sup> No behavior 'pawing' was observed from the video-recordings during the fourth visits. Therefore the correlation is zero. 'Pawing' for the first visit was observed, but there are no correlation between owners' assessments and the video-observations

<sup>7</sup> Only two owners assessed their dogs' activity level for the first and fourth visits.

\* $<0.05$

\*\* $<0.001$

\*\*\* $<0.0001$

**Table 3.2 Verbal descriptions are for interpreting correlation coefficients. The table is modified from its original form (from (Sprinthall, 2003) and cited from (Martin and Bateson, 2007).**

<0.2	Slight; almost negligible relationship
0.2-0.4	Low; definite but small relationship
0.4-0.7	Moderate; substantial relationship
0.7-0.9	High; marked relationship
0.9-1.0	Very high; very dependable relationship

### **3.3 The relationship between the dog owners' assessments of dogs' emotions and the actual dog behavior from the video-recordings**

The owners' assessments of their dogs' emotional state during the visits were correlated with actual dog behaviors measured from the video-recordings. The four visits were pooled together and overall correlations were used (table 3.3).

Displacement behaviors (snout licking, yawning and body shaking) as well as behavior 'escape' were slight or low correlated with both positive and negative emotions (see table 3.3 for  $r_s$  values). 'Looking at the owner' was correlated with the emotion irritated ( $r_s = 0,40$ ), and 'panting' was negatively correlated with stressed ( $r_s = -0,46$ ), both behaviors being also subtle signs for stress.

From contact seeking behaviors 'tail wagging' was correlated with joyful ( $r_s = 0,65$ ), satisfied ( $r_s = 0,55$ ) and pleasant ( $r_s = 0,57$ ). 'Bodily contact' was correlated with the same positive emotions as 'tail wagging', only correlations were negative ( $r_s = -0,55$ ;  $r_s = -0,49$  and  $r_s = -0,49$ , respectively). 'Tail wagging' was also negatively correlated with stressed ( $r_s = -0,47$ ), irritated ( $r_s = -0,42$ ), tired ( $r_s = -0,42$ ) and nervous ( $r_s = -0,51$ ). Additional three contact seeking behaviors, 'pushing snout', 'pawing' and 'approaching', were slightly or low correlated with emotions (see table 3.3 for  $r_s$  values).

The posture, 'standing', was correlated with the emotion calm ( $r_s = 0,41$ ), and negatively correlated with stressed ( $r_s = -0,46$ ), irritated ( $r_s = -0,53$ ) and tired ( $r_s = -0,53$ ). Contrarily to standing, 'sitting' was associated with negative emotions having correlations for strained ( $r_s = 0,47$ ), stressed ( $r_s = 0,60$ ), irritated ( $r_s = 0,64$ ), tired ( $r_s = 0,64$ ) and nervous ( $r_s = 0,42$ ). 'Sitting' was also negatively correlated with relaxed ( $r_s = -0,47$ ), satisfied ( $r_s = -0,54$ ), calm ( $r_s = -0,43$ ) and pleasant ( $r_s = -0,52$ ). 'Active' was associated with positive emotions joyful ( $r_s = 0,47$ ), satisfied ( $r_s = 0,40$ ) and pleasant

( $r_s = 0,40$ ). The posture, ‘laying down’, and ‘control from the owner’ were slightly or low correlated with the emotions (see table 3.3 for  $r_s$  values).

**Table 3.3. Spearman correlation coefficients ( $r_s$ ) between the owners’ assessment of their dogs’ emotions and actual dog behavior. P-values for significant correlations ( $p < 0.05$ ;  $p < 0.001$ ;  $p < 0.0001$ ) are shown. The colors are visualizing the strength of the relationship; explanations are showed in the table 3.2.**

Behaviors	Emotions									
	Joyful	Relaxed	Satisfied	Calm	Pleasant	Strained	Stressed	Irritated	Tired	Nervous
Escape	0.29	-0.14	0.29	-0.24	0.26	0.065	-0.0050	-0.14	-0.12	-0.19
Snout licking	-0.21	0.19	-0.24	0.065	-0.23	0.072	0.091	0.083	0.067	0.067
Yawning	0.14	0.27	0.13	0.095	0.099	-0.15	-0.22	-0.29	-0.35*	-0.35*
Body shaking	-0.14	0.036	-0.26	0.038	-0.30	0.059	0.13	0.27	0.036	0.036
Panting	0.26	0.22	0.29	0.24	0.32*	-0.37*	-0.46*	-0.31	-0.14	-0.14
Looking at the owner	-0.090	-0.13	-0.14	-0.36*	-0.087	0.26	0.27	0.40*	0.25	0.25
Pushing snout	-0.13	-0.16	-0.20	-0.071	-0.22	0.10	0.13	0.22	0.16	0.16
Pawing	0.077	-0.054	-0.020	-0.13	-0.037	0.043	0.0029	0.11	0.11	0.11
Tail wagging	0.65***	0.17	0.55**	-0.0072	0.57**	-0.38*	-0.47*	-0.42*	-0.42*	-0.51*
Approaching	0.23	-0.069	0.089	-0.16	0.12	-0.013	-0.022	0.0092	0.0092	0.15
Bodily contact	-0.55**	-0.11	-0.49*	0.041	-0.49*	0.25	0.32*	0.20	0.20	0.15
Standing	0.14	0.33*	0.28	0.41*	0.28	-0.35*	-0.46*	-0.53**	-0.53**	-0.30
Sitting	-0.39*	-0.47*	-0.54**	-0.43*	-0.52**	0.47*	0.60***	0.64***	0.64***	0.42*
Laying	0.010	-0.014	-0.012	-0.33*	0.0094	0.031	-0.063	0.051	0.051	-0.077
Active	0.47**	0.094	0.40*	0.038	0.40*	-0.17	-0.21	-0.16	-0.16	-0.19
Control from the owner	0.18	-0.16	0.19	-0.11	0.20	-0.0026	-0.015	-0.014	-0.014	-0.18

### 3.4 The relationship between the dog owners’ assessments of dogs’ behaviors and the dog owners’ assessments of dogs’ emotions

The owners’ assessments of dog behavior were correlated with their evaluations of dogs’ emotional state. The four visits were pooled together and overall correlation was used (table 3.4).

The behavior ‘escape’ and the displacement behaviors: ‘snout licking’, ‘body shaking’ and ‘looking at the owner’, had the same tendency to be positively associated with negative emotions, and vice versa, negatively associated with positive emotions. The behavior ‘escape’ was positively correlated with strained ( $r_s = 0,67$ ), stressed ( $r_s = 0,68$ ), irritated ( $r_s = 0,55$ ) and tired ( $r_s = 0,45$ ). It was

negatively correlated with joyful ( $r_s = -0,54$ ), relaxed ( $r_s = -0,64$ ), satisfied ( $r_s = -0,56$ ), calm ( $r_s = -0,64$ ) and pleasant ( $r_s = -0,58$ ). ‘Snout licking’ were associated with strained ( $r_s = 0,55$ ) and stressed ( $r_s = 0,63$ ); contrarily joyful ( $r_s = -0,58$ ), relaxed ( $r_s = -0,56$ ), satisfied ( $r_s = -0,57$ ) and pleasant ( $r_s = -0,54$ ) were negatively correlated. ‘Body shaking’ was correlated with all five negative emotions strained ( $r_s = 0,57$ ), stressed ( $r_s = 0,55$ ), irritated ( $r_s = 0,69$ ), tired ( $r_s = 0,68$ ) and nervous ( $r_s = 0,47$ ). And it was negatively correlated with joyful ( $r_s = -0,47$ ), satisfied ( $r_s = -0,57$ ), calm ( $r_s = -0,45$ ) and pleasant ( $r_s = -0,57$ ). ‘Looking at the owner’ was correlated with strained ( $r_s = 0,41$ ) and stressed ( $r_s = 0,41$ ), and negatively associated with relaxed ( $r_s = -0,50$ ) and calm ( $r_s = -0,45$ ).

Contrarily to the other displacement behaviors presented above, ‘panting’ was clearly associated with the positive emotions joyful ( $r_s = 0,50$ ), satisfied ( $r_s = 0,60$ ) and pleasant ( $r_s = 0,59$ ), and negatively associated with all the negative emotions, strained ( $r_s = -0,52$ ), stressed ( $r_s = -0,66$ ), irritated ( $r_s = -0,66$ ), tired ( $r_s = -0,69$ ) and nervous ( $r_s = -0,50$ ). ‘Yawning’ had slight or low correlations for emotions (see table 3.4 for  $r_s$  values).

Interestingly, contact seeking behavior, ‘pushing snout’, was correlated with stressed ( $r_s = 0,45$ ), irritated ( $r_s = 0,61$ ), tired ( $r_s = 0,65$ ) and nervous ( $r_s = 0,51$ ); and ‘pawing’ was correlated with same emotions ( $r_s = 0,54$ ), ( $r_s = 0,63$ ), ( $r_s = 0,69$ ), ( $r_s = 0,51$ ) respectively, and additionally with strained ( $r_s = 0,51$ ). The other contact seeking behaviors ‘tail wagging’, ‘approaching’, ‘bodily contact’ had the tendency being positively correlated with positive emotions, and negatively correlated with negative emotions (see table 4 for  $r_s$  values). Furthermore, ‘bodily contact’ had high correlations with joyful ( $r_s = 0,84$ ), satisfied ( $r_s = 0,85$ ) and pleasant ( $r_s = 0,87$ ); stressed ( $r_s = -0,71$ ), irritated ( $r_s = -0,72$ ), nervous ( $r_s = -0,72$ ).

The postures and ‘control from the owner’ were mostly slightly or lowly correlated with emotions (see table 3.4 for  $r_s$  values). ‘Standing’ was, though, negatively associated with stressed ( $r_s = -0,49$ ) and tired ( $r_s = -0,43$ ). And ‘sitting’ was negatively associated with calm ( $r_s = -0,47$ ).

**Table 3.4. Spearman correlation coefficients ( $r_s$ ) between the owners' assessment of behaviors and the owners' assessments of emotions for their dogs. P-values for significant correlations ( $p < 0.05$ ;  $p < 0.001$ ;  $p < 0.0001$ ) are shown. The colors are visualizing the strength of the relationship; explanations are showed in the table 3.2.**

Behaviors	Emotions									
	Joyful	Relaxed	Satisfied	Calm	Pleasant	Strained	Stressed	Irritated	Tired	Nervous
Escape	-0.54**	-0.64***	-0.56**	-0.64***	-0.58**	0.67***	0.68***	0.55**	0.45*	0.33*
Snout licking	-0.58**	-0.56**	-0.57**	-0.39*	-0.54**	0.55**	0.63***	0.38*	0.035*	0.29
Yawning	0.12	-0.089	0.10	-0.11	0.13	-0.034	-0.049	-0.21	-0.21	-0.35*
Body shaking	-0.47*	-0.27	-0.57**	-0.45*	-0.57**	0.57**	0.55**	0.69***	0.68***	0.47*
Panting	0.50*	0.35*	0.60***	0.20	0.59**	-0.52**	-0.66***	-0.66***	-0.69***	-0.50*
Looking at the owner	-0.25	-0.50*	-0.28	-0.45*	-0.23	0.41*	0.41*	0.21	0.20	0.23
Pushing snout	-0.25	-0.050	-0.26	-0.0081	-0.28	0.34*	0.45*	0.61***	0.65***	0.51*
Pawing	-0.15	-0.013	-0.28	-0.15	-0.26	0.51*	0.54**	0.63***	0.69***	0.51*
Tail wagging	0.66***	0.49*	0.63***	0.18	0.62***	-0.44*	-0.49*	-0.33*	-0.42*	-0.41*
Approaching	0.51*	0.41*	0.54**	0.37*	0.57**	-0.65***	-0.59**	-0.59**	-0.55**	-0.48*
Bodily contact	0.84***	0.64***	0.85***	0.59**	0.87***	-0.63***	-0.71***	-0.72***	-0.67***	-0.72***
Standing	0.20	0.28	0.22	0.24	0.24	-0.34*	-0.49*	-0.38*	-0.43*	-0.27
Sitting	-0.17	-0.30	-0.21	-0.47*	-0.22	0.37*	0.33	0.24	0.26	0.0031
Laying	0.083	-0.11	0.011	-0.27	0.011	0.093	0.028	0.086	-0.020	-0.0088
Active	0.22	-0.27	0.055	-0.29	0.077	0.16	0.34	0.32	-0.12	0.20
Control from the owner	-0.11	-0.22	-0.12	-0.27	-0.18	0.14	0.21	0.14	-0.10	0.030

## 4. DISCUSSION

The present study investigated an owner-dog interaction during the animal-assisted activities (AAA). The long term objective for the study is to improve the owner-dog interactions especially in the animal-assisted interventions. Three hypotheses were posed to reveal the owner-dog interaction regarding the behavior of the dogs and the emotions the dogs experienced, as interpreted by the owner. Firstly, the relationship between the owners' observations of dogs' behavioral signals and the actual behavior of the dogs registered from the video-recordings were measured. Secondly, the relationship between actual behavior of the dogs and owners' evaluations of the emotions the dogs experienced during the visit were measured. Thirdly, the relationship between the owners' evaluations of the dog behavior and the owners' evaluations of the dogs' emotions were measured. It needs to be stressed, that the causality between behavior and emotion assessed by the owner is not

unidirectional, since Spearman correlation measures the strength of the relationship without taking the causality into consideration (Kjær Ersbøll, et al., 2004). This means that an owner could have evaluated her dog's emotional state based on their observations of each behavior. Or besides that, the owner might have perceived her dog, for instance, joyful and then scoring the behavior 'tail wagging' high by knowing that the behavior is also signaling the positive state of mind in dogs.

#### **4.1 Displacement behaviors and escape**

Measuring acute stress in dogs, the behaviors such as body shaking, yawning and oral behaviors, including snout licking, swallowing and smacking, were typically displayed in the presence of a human administering the stimuli (Beerda, et al., 1998; Beerda, et al., 2000). 'Snout licking' and 'yawning' have been also called as appeasement gestures, which a dog displays when it tries to avoid and calm threatening situations (Rugaas, 2000; Kuhne, et al., 2012). The behavior 'panting' have been reported during acute stress (Beerda, et al., 1997), and it has been used as a behavioral parameter in assessing the level of pre-operative stress in dogs (Vaisanen, et al., 2004; Hekman, et al., 2012). These subtle signs of stress were rarely reported (Mariti, et al., 2012) and rarely recalled by the dog owners (Kerswell, et al., 2009). But the likelihood of reporting facial features (eyes, ears, mouth/tongue) as well as total number of features increased with observer's experience with dogs (Wan, et al., 2012). However, in the present study snout licking, yawning, body shaking, looking at the owner and panting were reported by the dog owners.

'Yawning' was correlated between the owners' evaluation of behavior and the actual dog behavior registered from the video-recordings. Although the owners had paid attention to this behavior, it was not perceived as associated with either positive or negative emotions.

The behavior 'panting' was correlated between the owners' evaluation of behavior and the actual dog behavior registered from the video-recordings. Seven of the eleven dogs involved in the study were Bernese Mountain dogs. All seven Bernese Mountain dogs were panting all the time during the observations (table 5b, Appendix 3). Presumably these dogs were warm indoors with their thick winter coat and therefore were panting. Opposite to these thick coated dogs, there were two hairless Chinese Crested dogs, which were not panting at all. When measuring association between actual dog behavior and the owners' assessments of the dogs' emotional state, 'panting' was negatively associated with the emotion 'stressed'. In the third hypothesis owners had associated the behavior 'panting' with a positive emotion. The owners' perception of 'panting' was negatively associated with negative emotions. In the other words, it seemed that the owners did not relate 'panting' with

negative emotions but rather with a positive emotional state. This could be due to that the owners of the Bernese Mountain dogs are used to their dogs being warm indoors and panting.

‘Body shaking’ and ‘snout licking’ were not correlated between the owners’ evaluation of behavior and the actual dog behavior registered from the video-recordings. These two behaviors were not associated with either positive or negative emotions, when actual dog behavior and the owners’ evaluation of dogs’ emotions were correlated. ‘Body shaking’ and ‘snout licking’ had the same tendency to be associated with negative emotions when the owners’ assessments of behaviors and the owners’ assessments of emotions were correlated. These two behaviors were also negatively associated with positive emotions. It was clear that the owners relate both behaviors with negative emotions. Mariti et al. (2012) found that ‘snout licking’ was one of the behaviors which was least identified by respondents as possible signal of stress in dogs. Kerswell et al. (2009) as well concluded that features in dog such as coat and snout/lips were reported low for all emotional categories by dog owners. Results in the present study are confirming findings that ‘body shaking’ and at least ‘snout licking’ are behaviors that can be easily overseen. Although the dog owners were not good at observing ‘snout licking’ in the present study, they had clearly associated ‘snout licking’ with emotions as ‘stressed’ and ‘strained’ in the third hypothesis.

‘Looking at the owner’ was not correlated between the owners’ evaluation of behavior and the actual dog behavior registered from the video-recordings. The emotion ‘irritated’ was associated with ‘looking at the owner’ when owners’ assessment of emotions and actual behavior were correlated. The emotions ‘strained’ and ‘stressed’ were associated with ‘looking at the owner’ when the owners’ assessments of behavior and the owners’ assessment of emotions were correlated. The behavior ‘looking/gazing at the human’, has been studied as a signal in communication between humans and dogs (Polgárdi, et al., 2000; Miklósi, et al., 2003; Merola, et al., 2012). There has been an interest in investigating whether dogs use referential looking with human as to obtain desired object (food or toy) (Polgárdi, et al., 2000) and seeking information about the environment from the human (Merola, et al., 2012). A referential looking has been defined as quick looks to the caregiver preceded and/or followed by a look to the novel object/situation (Russell, et al., 1997) whereas looking for reassurance from the owner should not include alternation in gaze from the owner to object (Merola, et al., 2012). Merola et al. (2012), among the other two aims, studied the presence of referential looking in dogs’ interacting with people when requesting an object/food was not involved. It was found out that dogs who did not behave confidentially towards a new stimulus (a

fan) carried out referential looking towards the owner more than the group of dogs that showed a confident, positive approach to the fan. In the present study, the owners may have interpreted eye contact as suggested by Merola et al. (2012), a dog looking for additional information from their owner when faced with ambiguous stimulus or situation indicating insecurity. The owners may have also interpreted that dog gazing at them were begging more treats from the owner. Whether the motivation for the behavior was either one; the results indicate that the behavior 'looking at the owner' was associated with negative emotional state by the owners. Communication between a human and a dog by looking/gazing seem to have a complex and delicate meaning. For this measure to be more informational when assessing the emotional state of a dog, the pattern of the behavior and the presence of the other behaviors should be included.

The behavior 'walking away' with the motivation escape was observed, but in low frequency. 'Walking away' was not correlated between the owners' evaluation of behavior and the actual dog behavior registered from the video-recordings. The correlation between the owners' assessments of dog behavior and the owners' assessments of the dogs' emotions clearly showed that the owners associated 'walking away/escape' with negative emotions. Jakovcevic et al. (2013) observed that dogs withdrew from the experimenter when the reward food was omitted in the study exploring frustration behavior in dogs, and furthermore it was suggested that the experiment produced mild or moderate stress. Dogs also tended to move away when preferred food was downshifted to less preferred food (Bentosela, et al., 2009). Additionally, withdrawal was observed in dogs after introducing a startling stimulus (King, et al., 2003) and it was observed when a human approached a dog in a threatening way (Vas, et al., 2005). Common for above mentioned studies was that withdrawal was accompanied with an aversive emotional state. In the present study, the owners were knowledgeable that 'walking away/escape' was associated with negative emotions or vice versa, as it was in the previous study where 'backing away' was associated with fear and submission by participants (Tami and Gallagher, 2009).

#### **4.2 Contact seeking behaviors**

In the present study dogs' contact seeking behaviors were observed towards a strange or slightly unfamiliar person, a visitee or personnel. It is essential to understand the context in the present study, since many studies investigating contact seeking behavior in dogs concentrate on owner-dog interaction. A dog might seek protection (Vas, et al., 2005), affection (Vaisanen, et al., 2004) or initiate play (Gyori, et al., 2010) depending of a context when seeking contact with its owner. Dogs'

reaction to friendly or threatening approach of unfamiliar person could be in some situations comparable with dog-visitee interactions (Vas, et al., 2005; Gyori, et al., 2010). Usually the visitees were already sitting and waiting for a dog owner team to arrive. Therefore the dogs were seeking contact with the visitees with help from their owners. A few times the visitees walked towards the dogs, but mostly they only called dogs and reached out for them. ‘Pushing the snout’, ‘pawing’, ‘approaching’ and ‘bodily contact’ were directed towards one visitee or a couple of closely sitting visitees at the time. ‘Tail wagging’ is more difficult to interpret if it is directed towards a single person or for the whole situation.

‘Tail wagging’ was correlated between the owners’ assessments of dog behavior and the actual dog behavior measured from the video-recordings. It had the highest correlation among all behaviors. The relationship between the actual behavior of ‘tail wagging’ and the owners’ assessments of emotions showed that ‘tail wagging’ was associated with positive emotions, and negatively associated with negative emotions. Also the owners’ assessments of behavior and the owners’ assessments of emotions, showed that the owners associate ‘tail wagging’ with the positive emotions, and negatively with the negative emotions. Findings are supporting results from the previous studies. The feature ‘tail’ was one of the most selected cues to interpret various behaviors of dogs by participants with different level of experience with dogs, but it was significantly associated with friendliness and play (Tami and Gallagher, 2009). Also in another study, the feature ‘tail’ was more likely to be chosen as an informative feature when interpreting a happy state of mind in dogs, though it was also chosen as signaling a fearful emotion (Wan, et al., 2012). Especially the movement of a tail (tail wagging and tail still) was most frequently used as cues interpreting dog behavior by participants, whereas position of tail and frequency of wag were used less often (Tami and Gallagher, 2009). The position of the tail was the most reliable indicator of status in a wolf pack (Fatjo, et al., 2007), and a type of tail wagging and a position of tail were to describe happy and fearful behavior of dogs (Wan, et al., 2012). In the present study, the tail’s position was not observed or asked to be assessed. Either the owners correctly associate ‘tail wagging’ with positive emotions, or the owners tend to associate any kind of tail wagging with positive emotions. For further analysis of dogs’ emotional state by using tail wagging as an indicator, tail wagging should be categorized more detailed.

‘Bodily contact’ and ‘approaching’ had low overall correlations between the owners’ assessments of behavior and the actual dog behavior measured from the video-recordings, but the correlations

varied over visits from highly negative to moderately positive. However, negative overall correlations show that the owners had difficulties to estimate the occurrence of these two behaviors. The results for 'body contact' in the second and the third hypothesis were contradicted.

The behaviors 'pushing snout' and 'pawing' had low overall correlations between the owners' assessments and the actual dog behavior. Both behaviors had also low correlations between the owners' assessments and the actual dog behavior. Surprisingly 'pushing snout' and 'pawing' were clearly related with negative emotions when the owners' assessments of emotions and the owners' assessments of behavior were correlated. There is no previous literature of these two behaviors as in context with contact seeking behavior. The reason why 'pushing snout' and 'pawing' were chosen to the ethogram where because the researcher had noticed that some of the dogs included in the study tended to display the behaviors in their home environment. Additionally, it was interesting to research whether these behaviors occurred in animal-assisted activities situations, but it was obvious that both behaviors were displayed seldom. It would be interesting to know whether these two behaviors are displayed more frequently in familiar or private settings, and therefore would not be as informative indicators for dogs' emotional state in animal-assisted interactions.

### **4.3 Postures**

The postures: standing, sitting, lying down and active, were chosen to be observed in this study. The postures of the dog such as, high, neutral and low, have been used indicators for stress (Beerda, et al., 1998). These types of postures were not included in the present study.

'Standing', 'sitting' and 'lying down' were correlated between the owners' assessments of dog behavior and the actual dog behavior measured from the video-recordings.

'Standing' was associated with the emotion 'calm', and negatively associated with negative emotions when the owners' evaluations of emotions and the actual dog behavior were correlated. 'Standing' was also negatively correlated with negative emotions when the owners' evaluations of emotions and the owners' evaluations of behavior were measured. Contrarily, 'sitting' was related with the negative emotions and negatively related with positive emotions when the owners' assessments of emotions and the actual dog behavior showed that. 'Sitting' was also negatively associated with positive emotion when the owners' assessments of emotions and the owners' assessments of behavior were correlated. 'Lying down' was not associated with emotions in either second or third hypothesis. Jakovcevic et al. (2013) associated behavior lying down in dogs with

frustration, and observed increase in this behavior when food was omitted. Kerswell et al. (2009) concluded that dog owners mainly recalled postures during the sad emotional state and anxious greeting in dogs. Tami and Gallagher (2009) found that sitting down/laying down were used to describe submissive behavior and sitting still was used to describe indifferent behavior in dogs by participants with different level of experience with dogs. They also concluded that the participants related upright/confidence stance and/or standing over to describe aggressiveness, confident and friendly behavior. The results in the present study are partly supporting previous findings since the owners had associated standing with positive emotional state and sitting with negative emotional state. In order to interpret the dogs' emotional state while standing, sitting or lying down, presence of other behaviors should be included.

'Active' was not correlated between the owners' assessment of behavior and the actual behavior measured from the video-recordings. The correlations, though, varied from very highly negative to moderately positive over the visits. 'Active' was associated with the positive emotions when the owners' assessments of emotions and the actual dog behavior were measured. 'Active' had low correlations between the owners' assessments of emotions and the owners' assessment of behaviors. In the previous studies increase in restlessness, walking around, have been indicating acute stress in dogs in social settings (Beerda, et al., 1998) and an increase in ambulation has been observed signaling frustration (Jakovcevic, et al., 2013). In the AAA situation activeness could be indicating stress by dogs being restless, frustrated as in the previous studies or indicating positive emotional state by dogs being active and approaching visitees.

#### **4.4 Control from the owner**

The overall correlation between the owners' assessment of 'control from the owner' and the actual behavior was low, although there were variation over the visits. The correlations for the second and the third hypotheses were also low. Tami and Gallagher (2009) concluded that participants linked owner directed behaviors for uneasiness. Cherenko Hendriksen (2012) found that the level of control from the owner and giving treats had an effect on dog behavior in animal-assisted interventions. She concluded that distance seeking behaviors and escape behavior increased with frequency of human manipulation, whereas contact seeking behaviors were increased with frequency of human giving treats to dogs. An explanation for why 'control from the owner' was not associated with dogs' emotional state by the owners, could be that it included both manipulation by giving treats and physical modulation of dog. Giving treats to dog could be associated with positive emotional state

with dog, while physical modulation could be related with for instance uneasiness and negative emotional state.

#### **4.5 Limitations of the study**

The Visual Analogue scale (VAS) can be presented different ways (Paul-Dauphin, et al., 1999). Respondents preferred combination of a behavior-based scale and VAS in order to improve owner-assessed scale to measure the severity of pruritus in dogs (Hill, et al., 2007). The simple (VAS) was chosen to register owners' evaluations of dogs' behaviors and dogs' emotions for this study. Some owners requested that it would be easier to mark the evaluations if the scale was with numerical ratings. When the scale was chose for the study, it was reasoned that most likely the owners cannot keep up with exact frequency of behaviors. The VAS scale shows the owners perception of the occurrence of behaviors and emotions. The minimum extreme end 'not at all' can be understood explicitly. For instance answer 'not at all' to a question 'How much was your dog wagging its tail' leaves no misinterpretations. On the other hand, the extreme 'very much' can be understood very differently, depending race variance or individual variance in dogs.

Additional parameters combined with behavioral observations might have given an objective evaluation of how the dogs experienced the animal-assisted activities. Measuring salivary cortisol and heart rate, have been used in previous researches to assess the level of stress during animal-assisted interventions (Haubenhofner, et al., 2005; Haubenhofner and Kirchengast, 2006; Haubenhofner and Kirchengast, 2007; King, et al., 2011; Cherenko Hendriksen, 2012; Glenk, et al., 2013).

#### **4.6 Behaviors relating to each hypothesis**

*The relationship between the dog owners' assessments of dogs' behavior and the actual dog behavior measured from the video-recordings*

The most obvious behaviors such as postures and tail wagging were most accurately among all the behaviors observed by the owners. Also yawning and panting, which are subtle signs, were also observed accurately by the owners.

AAA visits can be demanding environment for both the owners and dogs. The owners are concentrating on discussing with visitees and helping visitees to interact with their dogs. In that sense it is reasonable that some of the more subtle signs dogs are displaying are not noticed. It could also be that dog owners are not aware of what dogs are trying to signal with some subtle signs such as snout licking, which was not accurately predicted by the owners. The owners had difficulties to

predict contact seeking behaviors such as approaching, bodily contact and pawing. These behaviors were observed by the owners, but were not correlated with the dog behavior measured from video-recordings. Reason for this could be that approaching, bodily contact and pawing were over-reported.

*The relationship between the dog owners' assessments of dogs' emotions and the actual dog behavior from the video-recordings*

Postures such as standing, sitting and active were associated with emotions. Standing and active were associated with positive emotional state, while sitting was associated with negative emotional state. Reason for this could be that postures are exclusive behaviors. Other explanation could be that as long as dogs are standing and moving around the owners perceive that their dogs are experiencing positive emotions.

From contact seeking behaviors only two behaviors were associated with emotions. Tail wagging was associated with positive emotions and bodily contact was negatively associated with positive emotions. The owners of those dogs which were not so comfortable during visits may have overestimated positive emotions for their dogs and over-reported bodily contact, and therefore this behavior was associated negatively with positive emotions.

Panting and looking at the owner were only displacement behaviors which were associated with emotions.

*The relationship between the dog owners' assessments of dogs' behaviors and the dog owners' assessments of dogs' emotions*

Escape/walking away, displacement behaviors and contact seeking behaviors were associated with the emotions while postures were associated with the emotions in lesser extent. Displacement behaviors others than, yawning and panting, were associated with negative emotions. Walking away/escape was also associated with negative emotions. Panting was clearly associated with positive emotions and reasons for that were discussed earlier. Yawning was not associated with any emotions although it was accurately observed by the owners. This implies that the owners are not clear what dogs are signaling when yawning.

Bodily contact was strongly associated with positive emotions, which is supporting the theory that it could have been over-reported. Pushing snout and pawing were not associated with positive

emotions as expected. Postures were not associated with emotions as strongly as those were when actual dog behavior from the video-recordings and the owners' estimates of dog emotions were measured. Although, standing and sitting had the same tendency to be associated with positive and negative emotional state, respectively.

## **5. CONCLUSION**

This study investigated dog owners' observations of dog behaviors and the emotional states of the dogs during AAA.

Firstly, the study revealed that the dog owners during animal-assisted activities were best at evaluating dogs' postures (standing, sitting and lying down), tail wagging and two displacement behaviors, yawning and panting.

Secondly, postures (standing, sitting, active), tail wagging, bodily contact, panting and looking at the owners were associated with emotions when the owners' evaluations of the dogs' emotional state and the actual dog behavior were measured. Tail wagging, standing and active were associated with positive emotions, and looking at the owner and sitting were associated with negative emotions. 'Body contact' was negatively related with positive emotions. Panting was negatively related with 'stressed'.

Thirdly, escape/walking away, displacement behaviors except yawning, contact seeking behaviors and postures (sitting and standing) were associated when the owners' evaluations of dogs' emotions and the owners' evaluations of the dog behaviors were measured. Escape/walking away, snout licking, body shaking and looking at the owner were associated with negative emotions. These behaviors were also negatively associated with positive emotions. Pushing snout and pawing were associated with negative emotions, although those were contact seeking behaviors. Panting was associated with positive emotions. Contact seeking behaviors 'tail wagging', 'approaching' and 'bodily contact' were associated with positive emotions. These behaviors were also associated with negatively with negative emotions. Posture standing was negatively related with negative emotions, and sitting was negatively related with a positive emotion.

The owners were good at observing the most obvious behaviors (tail wagging, standing, sitting and lying down) and also yawning and panting which are more subtle signs. The behaviors and

emotions were associated correctly into some extent. 'Looking at the owner' and 'tail wagging' should be categorized in order to become more informational measures of the emotional state of the dog. 'Pushing snout' and 'pawing' were not good measures, because those were displayed seldom.

## **6. PERSPECTIVES**

The dog owners/handlers being the ones securing dog welfare during AAA visits, they should have sufficient knowledge to assess dogs' behavior and interpret it correctly in order to avoid unnecessary stress on dog. Based on the present study, it would be recommended for diverse organizations, professional or voluntary, which are involved with AAA/AAT, to provide guidance for dog owners regarding dog behavior and interpreting behavior. This could promote dog welfare and interaction between the visitees and the dogs as well as between the owners and the dogs. Additionally, it would be interesting to know whether the similar procedure, as in the present study, to evaluate dog behaviors and emotional states over several visits would enhance observational skills of the owners.

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Web page for the Finnish organization involved in AAA:

<http://suomenkarvakaverit.fi/>

## APPENDICES

### Appendix 1.

This questionnaire consists of three parts (A, B and C). The part A is about general information of the owner and the dog. Parts B and C are for dog owners to evaluate their dog's behavior and emotions during the animal-assisted activities.

#### Questionnaire part A

1. General information about the dog owner:

a. Name:

b. Age:

c. Gender:

d. Experience with dogs:

First time dog owner

Have owned a dog/dogs before

Working professionally with dogs

e. Experience of being involved with animal-assisted activities:

What is your experience of all type of animal-assisted interaction, also with other dog/dogs than the one participating in this study? Could you, estimate how many months/years you have been actively involved with animal-assisted interactions as well as how many times in a month you have been participating in animal-assisted interactions.

2. General information about the dog:

a. Name:

b. Age:

c. Breed:

d. Gender:

e. Neutered: yes/no

f. Your dog's experience of being a visiting dog:

What is your dog's experience of all type of animal-assisted interactions? Could You, estimate how many months/years your dog have been actively involved with animal-assisted interactions as well as how many times in a month your dog has been participating in animal-assisted interactions.

Name of the owner and the dog:

Date:

Where there other dogs present at the same time?

**The questionnaire, part B**

The questionnaire B consists of questions regarding your dog's behavior during the ten minutes of time in animal-assisted activities. Please, mark on the line (Visual Analogue Scale) your estimate of different behaviors displayed by your dog. "Not at all" and very often/Very much" are presenting extremes.

How often was your dog pulling the leash away from the visitee?

Not at all \_\_\_\_\_ Very often

How often was your dog licking the snout?

Not at all \_\_\_\_\_ Very often

How often was your dog yawning?

Not at all \_\_\_\_\_ Very often

How often was your dog shaking the body?

Not at all \_\_\_\_\_ Very often

How much was your dog panting?

Not at all \_\_\_\_\_ Very much

How often was your dog looking at you?

Not at all \_\_\_\_\_ Very often

How often was your dog pressing the snout against the visitee?

Not at all \_\_\_\_\_ Very often

How often was your dog lifting one of the front paws and reaching towards the visitee?

Not at all \_\_\_\_\_ Very often

How often was your dog wagging the tail relaxed?

Not at all \_\_\_\_\_ Very often

How often was your dog pulling the leash towards the visitee?

Not at all \_\_\_\_\_ Very often

How often was your dog within 10cm of the visitee?

Not at all \_\_\_\_\_ Very often

How much of the time was your dog standing?

Not at all \_\_\_\_\_ Very often

How much of the time was your dog sitting?

Not at all \_\_\_\_\_ Very often

How much of the time was your dog lying down?

Not at all \_\_\_\_\_ Very often

How much of the time was your dog moving around/being active?

Not at all \_\_\_\_\_ Very often

How often did you correct your the position or posture of your dog by voice, giving treat, or through physical modulation?

Not at all \_\_\_\_\_ Very often

### The questionnaire, part C

The questionnaire B consists of questions regarding your dog's emotions during the ten minutes of time in animal-assisted activities. Please, mark on the line (Visual Analogue Scale) your estimate of different behaviors displayed by your dog. "Not at all" and very often/Very much" are presenting extremes.

How joyful was your dog?

Not at all \_\_\_\_\_ Very much

How relaxed was your dog?

Not at all \_\_\_\_\_ Very much

How satisfied was your dog?

Not at all \_\_\_\_\_ Very much

How calm was your dog?

Not at all \_\_\_\_\_ Very much

How pleasant was the visit for your dog?

Not at all \_\_\_\_\_ Very much

How strained was your dog?

Not at all \_\_\_\_\_ Very much

How stressed was your dog?

Not at all \_\_\_\_\_ Very much

How irritated was your dog?

Not at all \_\_\_\_\_ Very much

How tired was your dog?

Not at all \_\_\_\_\_ Very much

How nervous was your dog?

Not at all \_\_\_\_\_ Very much

## Appendix 2.

**Table 1. General information about the dog owners.**

Owner ID	Age	Gender	Experience with dogs	Experience with AAA
1	44	woman	First time dog owner	10 months, 4 times in a month
2	46	woman	Has owned dog/dogs before	8months, 3 times in a month
3	38	woman	Has owned dog/dogs before	1,5years, 4 times in a month
4	45	woman	Has owned dog/dogs before	8 years, 2 times a month
5	43	woman	Has owned dog/dogs before	3 years, 2 times in a month
6	46	woman	Has owned dog/dogs before + Works professionally with dogs	more than 10 years, voluntarily 2-4 in a month, professionally full time job
7	70	woman	Has owned dog/dogs before	5years, 9 times in a month
8	23	woman	First time dog owner + Works professionally with dogs	2,5 years about 2-4 times in a month

**Table 2. General information of the dogs.**

Dog ID	Owner	Age	Breed	Gender	Neutered	Experience with AAA
A	1	1years 1month	Bernese Mountain dog	female	no	10 months, 4 times in a month
B	2	1years	Bernese Mountain dog	male	no	8months, 3 times in a month
C	3	1years 4months	Chinese Crested dog	male	no	1years 2months, 4 times in a month
D	3	2years 8months	Chinese Crested dog	male	no	1,5years, 4 times in a month
E	4	1years	Bernese mountain dog	male	no	8months, 2 times in a month
F	5	2years	Tibetan Spaniel	female	no	2 years, about 2 times a month
G	6	4 years 10month	Bernese Mountain dog	female	no	2 years 10 month, 2-4 times a month as voluntary and 1year has worked daily/weekly professionally
H	6	7years 2months	Bernese Mountain dog	male	yes	7 years altogether: 5years voluntarily 2-4 times in a month and 2 years professionally daily
I	6	1 years 10months	Bernese Mountain dog	male	yes	1years 8months, voluntarily 2-4 times in a month and professionally in daily/weekly.
J	7	1years	Bernese Mountain dog	female	no	7 months, 4 times a month (now about 9 times a month)
K	7	5 years	Scotch Collie	female	no	4 years 7months, 9 times a month
L	8	2,5 years	Cocker Spaniel	female	no	1,5 years, 2-4 times in a month

**Table 3. The dates and the institutions visited by the dog owner teams.**

<b>Dog ID</b>	<b>Dates</b>	<b>Places visited</b>	<b>Note</b>
<b>A</b>	13.3.2013	Paltanpuisto assisted living building	Pilot
	3.4.2013	Paltanpuisto assisted living building	
	27.3.2013	Paltanpuisto assisted living building	
	10.4.2013	Paltanpuisto assisted living building	
<b>B</b>	14.3.2013	Värttina assisted living building	
	28.3.2013	Värttina assisted living building	
	11.4.2013	Värttina assisted living building	
<b>C</b>	14.3.2013	Värttina assisted living building	
	28.3.2013	Värttina assisted living building	
	4.4.2013	Värttina assisted living building	
	11.4.2013	Värttina assisted living building	
<b>D</b>	14.3.2013	Värttina assisted living building	
	28.3.2013	Värttina assisted living building	
	4.4.2013	Värttina assisted living building	
	11.4.2013	Värttina assisted living building	
<b>E</b>	17.3.2013	Hoivakoti Hopea nursing home	Excluded
	8.4.2013	Simonkoti nursing home	
	13.4.2013	Hoivakoti Hopea nursing home	
<b>F</b>	17.3.2013	Hoivakoti Hopea nursing home	Excluded
	8.4.2013	Simonkoti nursing home	
	13.4.2013	Hoivakoti Hopea nursing home	
<b>G</b>	18.3.2013	Neliapila residency for intellectually disabled	
	19.3.2013	Neliapila	
	20.3.2013	Neliapila	
	21.3.2013	Neliapila	
<b>H</b>	18.3.2013	Neliapila residency for intellectually disabled	
	19.3.2013	Neliapila	
	20.3.2013	Neliapila	
	21.3.2013	Neliapila	
<b>I</b>	18.3.2013	Neliapila residency for intellectually disabled	
	19.3.2013	Neliapila	
	20.3.2013	Neliapila	
	21.3.2013	Neliapila	
<b>J</b>	18.3.2013	Neliapila residency for intellectually disabled	
	19.3.2013	Neliapila	
	20.3.2013	Neliapila	
	21.3.2013	Neliapila	
<b>K</b>	18.3.2013	Neliapila residency for intellectually disabled	Excluded
	19.3.2013	Neliapila	

	20.3.2013	Neliapila
	21.3.2013	Neliapila
<b>L</b>	26.3.2013	Runosmäki nursing home
	28.3.2013	Värttina assisted living building
	9.4.2013	Runosmäki nursing home

### Appendix 3.

**Table 4a. The owners' evaluations of different behaviors for each dog during the visits from 1 to 4. Rest of the behaviors are shown in the table 4b.**

Dog ID	Visit	Escape	Snout licking	Yawning	Body shaking	Looking at the owner	Pushing snout	Pawing	Tail wagging	Approaching
A	1	5	2	1	1	47	0	2	3	78
A	2	5	20	19	0	61	1	1	3	77
A	3	8	26	1	0	48	24	0	11	48
B	1	49	30	9	6	65	13	25	26	35
B	2	15	30	8	10	77	53	51	29	30
B	3	23	14	12	2	67	76	75	45	46
C	1	39	15	25	23	37	84	66	80	78
C	2	37	0	2	2	24	42	51	70	68
C	3	18	5	5	12	15	78	40	35	31
C	4	27	18	11	6	17	60	53	50	51
D	1	26	17	15	5	75	51	75	80	69
D	2	25	7	3	2	70	74	64	78	71
D	3	60	14	12	8	70	66	70	74	72
D	4	37	24	26	5	60	30	23	48	49
E	1	25	5	7	26	37	57	58	84	47
E	2	25	3	29	32	66	70	73	79	66
H	1	5	0	10	0	47	0	0	100	100
H	2	2	2	18	7	11	0	20	100	100
H	3	7	1	45	1	34	5	31	100	100
H	4	0	0	45	0	13	5	13	100	100
I	1	0	3	29	0	49	3	4	27	100
I	2	3	0	14	0	17	0	0	100	100
I	3	15	0	0	0	25	0	6	100	0
I	4	18	0	15	0	18	0	0	100	47
G	1	0	10	19	0	25	0	20	100	100
G	2	0	5	15	15	50	0	40	100	100
G	3	0	0	0	0	45	14	18	100	100
G	4	0	0	30	0	41	100	0	100	100
J	1	0	0	0	0	5	0	19	24	65

<b>J</b>	2	5	6	10	4						
<b>J</b>	3	20	0	10	10	98	45	100	100	0	
<b>J</b>	4	0	0	0	0	3	100	100	100	100	
<b>K</b>	1	0	5	5	5	25	100	100	100	6	
<b>K</b>	2	0	0	0	0	20	100	100	0	100	
<b>K</b>	3	0	0	0	0	3	100	100		100	
<b>L</b>	1	38	58	84	0	93	0	47	72	71	
<b>L</b>	2	49	0	25	0	75	24	0	100	100	
<b>L</b>	3	30	57	67	0	89	26	0	99	83	

**Table 4b. The owners' evaluations of different behaviors for each dog during the visits from 1 to 4.**

Dog	Visit	Panting	Bodily contact	Standing	Sitting	Lying down	Active	Control from the owner
A	1	93	99	96	15	1	46	6
A	2	81	98	98	0	0	18	8
A	3	84	98	99	0	0	37	15
B	1	51	75	78	4	2		69
B	2	71	48	50	47	15	33	77
B	3	78	83	22	72	20	64	29
C	1	0	96	65	39	0		33
C	2	0	67	42	48	0	68	75
C	3	0	93	17	83	51	27	10
C	4	0	67	16	73	0	33	27
D	1	0	92	70	39	0		59
D	2	0	74	32	65	0	59	51
D	3	0	77	70	48	6	62	43
D	4	0	47	39	55	0	40	36
E	1	20	84	88	45	3		19
E	2	48	84	28	70	25	75	67
H	1	100	100	50	46	45		58
H	2	100	100	45	45	47		35
H	3	100	100	100	100	100		45
H	4	100	100	100	50	50		34
I	1	80	100	100	9	0		46
I	2	100	54	100	0	0		31
I	3	100	100	100	0	0		52
I	4	100	100	100	0	0		38
G	1	100	100	100	17	0		47
G	2	100	100	100	10	0		5
G	3	100	100	100	14	0		20
G	4	100	100	100	0	0		43
J	1	0	100	75	3	5		23
J	2	5						5
J	3	100	100	100	100	10		20
J	4	0	100	0	0	0		3
K	1	3	100	5	5	5		100
K	2	5	100	0	0	0		0
K	3	0	100	0	0	0		5
L	1	81	100	15	78	19	45	46
L	2	100	100	42	83	34	64	49
L	3	85	100	9	95	0		45

**Table 5a. Frequencies for different behaviors for each dog during the visits from 1 to 4 measured from the video-recordings. Rest of the behaviors are shown in the table 5b.**

Dog ID	Visit	Escape	Snout licking	Yawning	Body shaking	Looking at the owner	Pushing snout	Pawing	Tail wagging	Approaching	Control from the owner
A	1	0	19	2	0	2	0	0	6	10	3
A	2	0	6	2	0	6	0	0	1	3	2
A	3	0	8	1	0	2	0	0	0	5	4
B	1	0	15	1	0	15	1	1	16	12	8
B	2	0	4	0	1	35	0	2	7	11	5
B	3	0	10	0	1	14	0	3	13	7	2
C	1	0	6	4	3	3	0	0	20	7	3
C	2	0	1	3	2	9	0	0	21	10	6
C	3	0	11	3	1	0	0	0	8	4	1
C	4	0	6	2	1	7	0	0	20	7	3
D	1	0	19	3	3	8	0	0	34	25	3
D	2	0	9	1	3	10	0	0	23	18	1
D	3	0	9	1	2	17	0	3	25	18	2
D	4	0	15	3	3	18	0	0	29	11	3
E	1	1	5	2	4	7	1	1	51	13	4
E	2	0	10	5	1	1	0	13	28	3	2
H	1	0	3	6	0	6	0	0	72	4	5
H	2	1	11	6	1	13	0	1	70	9	5
H	3	0	9	9	2	3	0	4	136	9	6
H	4	0	4	7	1	2	0	0	80	5	4
I	1	0	4	3	0	1	0	0	39	9	2
I	2	0	3	3	0	3	0	1	64	20	1
I	3	0	10	2	2	3	0	0	43	16	5
I	4	0	8	4	1	7	0	0	28	21	5
G	1	0	19	3	2	12	0	1	43	6	4
G	2	0	11	3	3	8	2	3	33	14	2
G	3	0	11	0	1	4	0	3	43	8	2
G	4	0	21	4	2	13	0	0	88	7	2
J	1	0	1	1	1	4	0	1	44	12	4
J	2	0	1	1	0	20	0	0	49	10	10
J	3	1	6	1	0	22	0	1	65	14	3
J	4	0	2	0	2	26	0	0	84	13	5
K	1	2	2	0	0	7	0	0	28	12	6
K	2	0	2	2	0	5	0	1	6	16	3
K	3	0	7	0	0	16	0	0	6	9	5
L	1	7	2	3	0	8	0	1	65	12	6
L	2	5	2	0	1	3	0	0	146	12	5
L	3	3	1	1	0	9	0	0	124	11	9

**Table 5b. Duration (s) of different behaviors for each dog during the visits from 1 to 4 measured from the video-recordings.**

Dog ID	Visit	Panting	Bodily contact	Standing	Sitting	Lying down	Active
A	1	600	562,7	415,8	104,9	0	79,3
A	2	600	580,6	570,8	0	0	29,2
A	3	600	518,3	523,7	0	0	76,3
B	1	600	494,2	349,7	95,5	3,8	151
B	2	600	391,3	143,5	304,3	22,4	129,8
B	3	600	519,5	52,3	437,5	8,5	101,7
C	1	0	496	102,1	304,1	0	193,8
C	2	0	328,2	192,7	86,3	0	321
C	3	0	558,9	28,5	493,9	0	77,6
C	4	0	451,8	155,9	217,1	10,6	216,4
D	1	0	409,2	99,7	252,7	0	247,6
D	2	0	471,1	166,4	256,7	0	176,9
D	3	0	443,3	148,9	217,5	0	233,6
D	4	0	436,6	55,6	360,7	0	183,7
E	1	600	417,6	88,5	314,8	0	196,7
E	2	600	550,2	60,5	463,4	7,3	68,8
H	1	600	433,9	243,2	99	131	126,8
H	2	600	425,5	142,3	82	241,5	134,2
H	3	600	427,1	231,1	164,4	50,4	154,1
H	4	600	466,6	191,3	112,6	126	170,1
I	1	600	244,2	320,2	0	5,4	274,4
I	2	600	236	296,8	4,5	0	298,7
I	3	600	267,1	269,3	0	0	330,7
I	4	600	317,2	295,7	10,2	0	294,1
G	1	600	493,3	442	51,7	0	106,3
G	2	600	488,4	424,6	0	0	175,4
G	3	600	501,2	328,2	112,8	0	159
G	4	600	465,7	412,7	0	0	187,3
J	1	600	380,9	176,1	160,5	0	263,4
J	2	600	274,2	170,9	193,8	4,9	230,4
J	3	600	223,6	191,2	99,7	14,7	294,4
J	4	600	253,4	160,8	131	0	308,2
K	1	241,6	174,9	40,4	102,7	0	456,9
K	2	480	198,7	220,3	16,3	0	363,4
K	3	381,5	275	135,5	203,5	0	261
L	1	90,9	372	151,5	180,8	0	267,7
L	2	229,8	204,5	56,8	194,1	5,2	343,9
L	3	193,8	262,7	102,1	159,4	0	338,5

**Table 6. The owners' evaluations of dogs' emotions for each dog during the visits from 1 to 4.**

Dog ID	Visit	Joyful	Relaxed	Satisfied	Calm	Pleasant	Strained	Stressed	Irritated	Tired	Nervous
A	1	74	88	87	99	95	5	5	0	2	2
A	2	73	84	84	100	95	3	5	0	3	1
A	3	57	75	95	98	93	10	7	1	3	12
B	1	73	26	40	39	39	47	61	54	3	31
B	2	76	44	75	45	75	9	13	23	10	35
B	3	69	71	74	40	81	17	47	33	5	35
C	1	92	86	90	78	91	12	16	11	6	5
C	2	72	74	84	70	78	23	23	22	5	9
C	3	94	89	92	91	93	9	10	7	9	8
C	4	50	85	49	77	60	18	14	3	30	0
D	1	97	50	69	25	89	17	40	6	18	29
D	2	83	85	84	87	87	4	15	3	3	15
D	3	93	91	92	90	96	8	6	10	9	4
D	4	60	78	74	67	73	12	11	9	43	2
E	1	81	73	75	81	78	8	11	12	14	12
E	2	86	74	82	90	81	12	22	10	27	11
H	1	100	100	100	78	100	0	0	0	0	0
H	2	100	100	100	60	100	0	0	0	0	0
H	3	100	100	100	100	100	0	0	0	0	0
H	4	100	100	100	100	100	0	0	0	0	0
I	1	100	100	100	100	100	0	0	0	0	0
I	2	100	78	100	48	100	0	0	0	0	12
I	3	100	100	100	100	100	0	0	0	0	0
I	4	100	100	100	100	100	0	0	0	0	0
G	1	100	100	100	100	100	0	0	0	0	0
G	2	100	100	100	100	100	0	0	0	0	0
G	3	100	100	100	100	100	0	0	0	0	0
G	4	100	100	100	100	100	0	0	0	0	0
J	1	100	75	95	93	98	0	0	0	0	0
J	2	95	40	95	60	100	5	5	5	5	5
J	3	100	100	100	45	100	30	5	5	30	6
J	4	100	100	100	100	100	5	5	5	5	5
K	1	100	100	100	100	100					
K	2	100	100	100	100	100	0	0	0	5	3
K	3	100	100	100	100	100	0	5	5	3	6
L	1	100	63	100	62	100	71	36	0	0	0
L	2	100	50	100	75	100	0	0	0	0	0
L	3	100	74	100	84	100	0	4	0	0	0

## Appendix 4.

Table 7. A number of dog owner teams (n) for each visit, and behaviors assessed by the owners.

Behavior	Visit 1		Visit 2		Visit 3		Visit 4		Total	
	n	Owners' assessment	Total n	Total for owners' assessments						
Escape	11	11	11	11	10	10	6	6	38	38
Snout licking	11	11	11	11	10	10	6	6	38	38
Yawning	11	11	11	11	10	10	6	6	38	38
Body shaking	11	11	11	11	10	10	6	6	38	38
Panting	11	11	11	11	10	10	6	6	38	38
Looking at the owner	11	11	11	10	10	10	6	6	38	37
Pushing snout	11	11	11	10	10	10	6	6	38	37
Pawing	11	11	11	10	10	10	6	6	38	37
Tail wagging	11	11	11	10	10	9	6	6	38	36
Approaching	11	11	11	10	10	10	6	6	38	37
Bodily contact	11	11	11	10	10	10	6	6	38	37
Standing	11	11	11	10	10	10	6	6	38	37
Sitting	11	11	11	10	10	10	6	6	38	37
Lying down	11	11	11	10	10	10	6	6	38	37
Active	11	2	11	6	10	4	6	2	38	14
Control from the owner	11	11	11	10	10	10	6	6	38	37

Table 8. A number of dog owner teams (n) for each visit and emotions assessed by the owners.

Emotion	Visit 1		Visit 2		Visit 3		Visit 4		Total	
	n	Owners' assessment	Total n	Total for owners' assessments						
Joyful	11	11	11	11	10	10	6	6	38	38
Relaxed	11	11	11	11	10	10	6	6	38	38
Satisfied	11	11	11	11	10	10	6	6	38	38
Calm	11	11	11	11	10	10	6	6	38	38
Pleasant	11	11	11	11	10	10	6	6	38	38
Strained	11	10	11	11	10	10	6	6	38	37
Stressed	11	10	11	11	10	10	6	6	38	37
Irritated	11	10	11	11	10	10	6	6	38	37
Tired	11	10	11	11	10	10	6	6	38	37
Nervous	11	10	11	11	10	10	6	6	38	37

## Appendix 5.

Table 9. Min, Q1, Median, Q3 and Max for the actual dog behaviors measured from the video-recordings.

Behavior	Minimum	Q1	Median	Q3	Maximum
Escape	0	0	0	0	7
Snout licking	1	3	6,5	10,75	21
Yawning	0	1	2	3	9
Body shaking	0	0	1	2	4
Looking at the owner	0	3	7	13	35
Pushing snout	0	0	0	0	2
Pawing	0	0	0	1	13
Approaching	3	7	10,5	13	25
Control from owner	1	2	4	5	10
Panting	0	202,8	600	600	600
Bodily contact	174,9	274,4	426,3	492,075	580,6
Standing	28,5	110,45	173,5	296,525	570,8
Sitting	0	59,275	121,9	217,4	493,9
Lying down	0	0	0	5,35	241,5
Active	29,2	138,4	195,25	289,175	456,9
Tail wagging	0	20	33,5	64,75	146

Table 10. Min, Q1, Median, Q3 and Max for the owners' evaluations of dog behavior.

Behavior	Minimum	Q1	Median	Q3	Maximum
Escape	0	0	11,5	25,75	60
Snout licking	0	0	4	14,75	58
Yawning	0	3,5	11,5	23,5	84
Body shaking	0	0	1	6	32
Panting	0	0	79	100	100
Looking at the owner	3	20	45	66	98
Pushing snout	0	0	26	70	100
Pawing	0	4	31	66	100
Tail wagging	0	42,5	80	100	100
Approaching	0	48	72	100	100
Bodily contact	47	84	100	100	100
Standing	0	28	70	100	100
Sitting	0	3	39	65	100
Lying down	0	0	0	15	100
Active	18	34	45,5	63,5	75
Control from owner	0	19,25	35,5	48,5	100

**Table 11. Min, Q1, Median, Q3 and Max for the owners' evaluations of dogs' emotions.**

<b>Behavior</b>	<b>Minimum</b>	<b>Q1</b>	<b>Median</b>	<b>Q3</b>	<b>Maximum</b>
<b>Joyful</b>	50	81,5	100	100	100
<b>Relaxed</b>	26	74	87	100	100
<b>Satisfied</b>	40	84	100	100	100
<b>Calm</b>	25	67,75	90	100	100
<b>Pleasant</b>	39	89,5	100	100	100
<b>Strained</b>	0	0	4	12	71
<b>Stressed</b>	0	0	5	13	61
<b>Irritated</b>	0	0	0	7	54
<b>Tired</b>	0	0	3	6	43
<b>Nervous</b>	0	0	2	9	35