

# Impact of human caregiving style on the dog-human bond

*Mänsklig omvårdnadsstils inverkan på bandet mellan hund-  
människa*

Anna Fahlgren



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## Preface

This master's thesis accounts for 30 credits within the Animal Science programme, at the Department of Animal Environment and Health at the Swedish University of Agricultural Sciences (SLU).

I want to thank my supervisor Therese Rehn for all the support, good discussions and for giving me the opportunity to study such an interesting subject. Also, thanks to Johanna Habbe, Eva Bodfäldt, Sara Westin, Melanie Bava, Moa Rosén and Rebecka Hansson for our good collaboration during the practical study.

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## Abstract

Research about attachment behaviours of dogs as a response to human caregiving behaviour as well as the owner's view of the relationship, is of relevance for the welfare of the dog and the owner. Dogs have been observed showing similar attachment behaviours toward humans as seen in children toward a parent. There are four different attachment styles defined within the human psychology; insecure anxious, insecure avoidant, secure and disorganised attachment. A person with one type of adult attachment style usually has a corresponding caregiving style. These caregiving styles have been applied within the anthrozoology through surveys and during studies of dog behaviour during challenging situations. The caregiving styles secure and disorganised and their impact on behaviour in Beagles in challenging situations has been studied at the Swedish University of Agricultural Sciences (SLU) in 2017. In 2019, a similar study was performed with Beagles at SLU with the two other caregiving styles, insecure avoidant and insecure anxious.

The main aim of this master's thesis was to investigate if there were any correlations between human caregiving styles and the dog's support seeking behaviour, with focus on the insecure avoidant and insecure anxious caregiving style. This part was performed during a practical study where the behaviour of Beagle dogs was studied during three types of challenging situations; a visual surprise, a sudden noise and during the approach of a strange looking person. These tests were done before and after an interaction period of 15 days. The dogs interacted with an insecure avoidant and an insecure anxious test person during approximately 20 minutes per person and day. Moreover, the adult attachment style (our indirect measure of caregiving) of owners of private dogs and their satisfaction of the relationship with their dog was correlated to the dog's behaviour during challenging situations. This latter part was performed using volunteer dog owners and their dog's results from the dog mentality assessment (DMA).

The practical study showed that the dogs initiated contact seeking behaviours toward both persons with an avoidant caregiving style and an anxious caregiving style, suggesting that the dogs' preferences of caregiving might vary according to their own basic temperament. The survey revealed that owners' adult attachment style (human caregiving style) correlated with the dog owners' view of the relationship to their dog, which might have similarities with their view of relationship to humans. The response of the dog to the challenging situations measured in the DMA correlated with the quality of the bond between dog and human and might be affected by owner caregiving style. Further studies are required to investigate what an impact these relations might have on everyday life for the welfare of dog and human.

## Sammanfattning

Forskning om hur anknytningsbeteende hos hund påverkas av mänsklig omvårdningsstil samt hur hundägare uppfattar relationen till sin hund, är relevant för hundens och ägarens välfärd. Hundar har uppvisat anknytningsbeteenden gentemot sina ägare på ett liknande sätt som observerats hos barn gentemot sina föräldrar. Det finns fyra olika anknytningsstilar definierade inom humanpsykologin; osäker-ambivalent, osäker-undvikande, säker samt den desorganiserade/oförutsägbara. En person med *en* slags vuxen anknytningsstil har vanligtvis motsvarande omvårdningsstil. Omvårdningsstilarna har studerats inom antrozoologin genom enkäter och vid studier av hundars beteende under utmanande situationer. Den säkra och desorganiserade/oförutsägbara omvårdningsstilen och dess påverkan på beaglar under utmanande situationer har studerats under år 2017 på Sveriges lantbruksuniversitet (SLU). Under år 2019 har en liknande studie genomförts med beaglar på SLU med de två andra omvårdningsstilarna, osäker-ambivalent samt osäker-undvikande.

Det huvudsakliga syftet med examensarbetet var att undersöka om det finns korrelationer mellan mänsklig omvårdningsstil och hundars kontaktsökande/stödsökande beteenden, med fokus på den osäkra-ambivalenta samt osäkra-undvikande omvårdningsstilen. Detta studerades vid en praktiskt studie då beteende hos beaglar observerades under tre utmanande situationer; en visuell överraskning, plötslig ljudöverraskning samt under närmandet av en främmande person. Dessa tester genomfördes före samt efter en interaktionsperiod av 15 dagar. Hundarna fick under denna period interagera med en osäker-ambivalent samt en osäker-undvikande testperson under ungefär 20 minuter per person och dag. I tillägg korrelerades den vuxna anknytningsstilen (vårt indirekta mått på omvårdningsstil) för ägare av privata hundar och hur nöjda de var med relationen till sin hund till hundens beteende under utmanande situationer. Detta genomfördes med hjälp av frivilliga hundägare och deras resultat från Mentalbeskrivning Hund (MH).

Resultatet av den praktiska studien visade att hundarna initierade kontaktsökande/stödsökande beteenden gentemot både personer med en osäker-ambivalent omvårdningsstil samt en osäker-undvikande omvårdningsstil och att deras preferenser av omvårdningsstil kan variera, vilket möjligen kan vara relaterat till deras grundtemperament. Enkätresultatet visade att hundägares vuxna anknytningsstil (mänsklig omvårdningsstil) korrelerade med hundägarnas uppfattning av relationen till sin hund, vilken kan ha likheter med deras uppfattning av relationer till andra människor. Hundens beteende under de utmanade situationerna i MH korrelerade med ägarens belåtenhet med relationen till sin hund och påverkas möjligen av ägarens omvårdningsstil. Fortsatta studier krävs för att undersöka inverkan av dessa samband på vardagslivet för hundens och ägarens välfärd.

## Populärvetenskaplig sammanfattning

Hundar har en självklar del i många människors liv. Forskning om hur människor med sitt beteende kan påverka hundens beteende samt hur ägaren uppfattar relationen till sin hund, är viktig för både hundens och ägarens välmående. Bandet mellan hund och människa har visat sig efterlikna hur barn knyter an till sina föräldrar. Inom humanpsykologin har fyra olika sätt som barn knyter an till sina föräldrar (anknytningsstilar) observerats; en ängslig, en undvikande, en säker samt en desorganiserad (oförutsägbar). Dessa stilar kan behållas av barnet in i vuxenlivet. En person med en slags vuxen anknytningsstil har vanligtvis motsvarande omvårdningsstil (beteende) gentemot sitt eget barn. Denna vetenskap hämtad från humanpsykologin har använts för att studera bandet mellan hund-människa.

Det huvudsakliga syftet med detta arbete var att undersöka om det finns samband mellan människors sätt att bete sig gentemot sina hundar och i vilken grad hundarna söker stöd samt kontakt under utmanande situationer. Arbetet fokuserade på att studera den ängsliga och den undvikande omvårdningsstilen. Detta studerades vid en praktiskt studie med beaglar som ägdes av SLU, då hundarnas beteende observerades under en visuell överraskning, plötslig ljudöverraskning samt under närmandet av en person klädd i hatt, solglasögon och en lång rock. Dessa tester gjordes före samt efter en interaktionsperiod av 15 dagar. Hundarna fick under denna period umgås med en ängslig samt en undvikande testperson under ungefär 20 minuter per person och dag. Den ängsliga personen uppförde sig stressat, var orolig och ville vara nära hunden. Den undvikande personen ville inte ha hunden nära och tilltalade hunden genom korta kommandon. I tillägg undersöktes den vuxna anknytningsstilen, vilken troligen kan förutse personens omvårdningsstil, för ägare av privata hundar och hur nöjda de var med relationen till sin hund jämfördes med hundens beteende under utmanande situationer. Detta genomfördes med hjälp av frivilliga hundägare och deras hunds resultat från Mentalbeskrivning Hund (MH).

Resultatet av den praktiska studien visade att hundar sökte kontakt och stöd från både personer som var ängsliga eller undvikande och att deras preferenser av omvårdningsstil kan variera, kanske relaterat till deras grundtemperament. Enkätresultatet visade att människors omvårdningsstil kan påverka hur hundägare uppfattar relationen till sin hund och att denna uppfattning kan ha likheter med hundägarens uppfattning av sin relation till andra människor. Hundens beteende under MH kan enligt enkäten påverka relationen mellan hund och ägare och hundens beteende kan eventuellt påverkas av ägarens omvårdningsstil. Det kommer att behövas fler studier för att ta reda på vilken påverkan sambanden som hittades i denna studie kan ha på vardagslivet för hundens och ägarens välmående.

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# 1 Introduction

Dog owners view the relationship with their dogs differently, which might depend on the dog's mentality and owner characteristics (Meyer & Forkman, 2014). A stronger emotional bond has been suggested by owners of dogs with more fearful and aggressive behaviour compared to owners with less fearful dogs (Meyer & Forkman, 2014) and more neurotic owners have reported to view their dog more as a social support for them (Kotrschal *et al.*, 2009). Nevertheless, sociability seems to be an appreciated personality trait among dog owners (Svartberg, 2003). Today, there are about 900 000 dogs in Sweden (Jordbruksverket, 2019), which are used for many different purposes such as company, dog sports or police work. Dog owners who are using their dog for more activities than only company have reported a stronger emotional bond to their dog (Meyer & Forkman, 2014). Furthermore, more neurotic owner have reported to be less involved in activities with their dog (Kotrschal *et al.*, 2009).

The bonding between dog and owner has been suggested to be similar to the bonding between infant and parent (Topál *et al.*, 1998). Dogs have been observed showing attachment behaviours toward humans (Topál *et al.*, 2005) as seen in children toward their parent (Bretherton, 1992). Attachment behaviours such as proximity seeking and playing more while owner is present have been observed among dogs (Topál *et al.*, 1998). Dogs might due to selective breeding have become more attached to humans (Topál *et al.*, 2005). Attachment behaviours have been observed toward a human caregiver in hand-reared wolf pups (Hall *et al.*, 2015). Nevertheless, according to Hall *et al.* (2015) is it unknown whether attachment behaviour can be observed in adult wolves toward humans. Dogs show more contact seeking behaviours toward their owner compared with a stranger (Topál *et al.*, 1998) and the amount of contact seeking behaviours dogs show toward a human that they know, might depend on the person's caregiving behaviour (Habbe, 2018).

Research about attachment behaviours of dogs as a response to human caregiving behaviour as well as the owner's view of the relationship, is of relevance for the welfare of the dog and the owner. This might give a better understanding of what makes the relationship satisfying from both the human's and the dog's perspective.

## 1.1 Attachment styles and their background in human psychology

Attachment style theory describes attachment of a child toward his/her mother and was established by John Bowlby in collaboration with Mary Salter Ainsworth during the 20<sup>th</sup> century, at a time when the focus was on the female parent (Bretherton, 1992). In the 1950s, Bowlby described attachment as the emotional tie of a child to his/her mother (Bowlby, 1958). Ainsworth contributed to the concept that children can use their mothers as a *secure base* (Bretherton, 1992). This means that they use their mother as a support which is making it possible for them to successively face challenges on their own. During a study of infants and their mothers, three attachment patterns were found, non-attached babies, securely attached or insecurely attached. The insecurely attached babies cried more when the mother was present compared to the securely attached babies, whereas the securely attached babies explored more in the presence of the mother and the insecurely attached babies did not explore much. For the babies classified as non-attached the presence of the mother made no difference.

A strange situation procedure (ASSP) was developed to study attachment behaviours in children toward their mothers (Ainsworth & Bell, 1970). The ASSP should be enough challenging for the children to express attachment behaviours. The ASSP consists of eight episodes, summarised in Table 1, which takes place in a furnished room with toys and two chairs, one for the child's mother and one for a stranger. Attachment behaviours studied by Ainsworth & Bell (1970) during ASSP were proximity, contact seeking behaviours and if contact seeking behaviours were maintained by the child. If the child avoided or resisted contact was also studied as well as if the child searched for the mother by for example trying to open the door when she left the room.

*Table 1. Summarise of the Ainsworth's Strange Situation Procedure (ASSP), modified from Ainsworth & Bell (1970)*

Episode (Interacting persons, M=mother, C=child, S=stranger, O=observer)	Description
One (C, M, O)	C is carried by M which enters the room with O. O leaves the room
Two (C, M)	C is put down by M, which goes and sits in a chair (three minutes episode)
Three (C, M, S)	S enters the room, sits down for one minute and then speaks to M for one minute. S shows C a toy and M leaves the room at the end of the ep- isode (three minutes episode)
Four (C, S)	S lets C play. If C is not interested S tries to en- gage C in play. If C is distressed S tries to com- fort or distract C. The episode is finished earlier than after three minutes if C cannot be com- forted by S
Five (C, M, S)	M returns and stands in the doorway for a while to await reaction from C. S leaves the room
Six (C)	C is alone in the room during three minutes, the episode can be interrupted earlier depending on reaction of C
Seven (C, S)	S returns and acts according to episode four for three minutes
Eight (C, S, M)	M returns and S leaves. The test is finished

In the 1970s, three attachment styles were defined as insecure ambivalent/anxious, insecure avoidant and secure, which in the 1980s were related to attachment in adulthood (Bretherton, 1992). In a study of George & Solomon (1996) anxious, avoidant, secure and a fourth, disorganised attachment (first described by Main & Solomon, 1986), were related to adult attachment. Interviews were done with mothers of six year old children which resulted in a connection between parent caregiving style and children attachment style. Behaviour of the parent might influence the behaviour of the child and result in the child getting the same adult attachment style, nevertheless a person can have been through insecure caregiving through childhood but later develop a more secure adult attachment style (George & Solomon, 1996). Caregiving and attachment relates to each other and a person who for example is having an insecure caregiving style often has an insecure attachment style (Symons

*et al.*, 2016). Someone's attachment style can be investigated through asking questions about perception of self and others (Feeney *et al.*, 1994), whereas caregiving style can be investigated by studying how someone cares for and protects another individual (George & Solomon, 2008).

#### 1.1.1 Disorganised and secure attachment/caregiving

A disorganised person can be described as not having control over her and her child's life and being unpredictable (George & Solomon, 1996). The caregiving style can be a result of substance addiction, abuse or other trauma and might result in that the child takes on the role as the caregiver of the parent. A mother with secure caregiving is seeing herself as the caregiver of the child, adjusting her behaviour according to her child's needs. She values relationships and has a positive perception of self (Feeney *et al.*, 1994). A secure individual is better of providing a *safe haven* to the attachment figure compare to a more insecure person (Mikulincer & Shaver, 2012). By *safe haven* means that the caregiver provides security and comfort for the attachment figure during distress. Moreover, she provides a so called *secure base* for the child, which means that the child dare to explore the environment if the mother is present.

#### 1.1.2 Anxious attachment/caregiving

An anxious caregiver can be described as uncertain and questioning herself, her child and their relationship (George & Solomon, 1996). As a consequence, she might find it hard to make decisions, unsure about how she is supposed to act. She can find it hard to evaluate herself as a parent, describing positive attributes of her child, nevertheless, finding it difficult to describe origins of negative attributes of the child. According to George & Solomon (1996) people with an anxious attachment style let other people define them. Anxious people find it important to be likeable by others and several studies have shown that people with more anxious attachment have a lower self-esteem compare to people with a more secure attachment (Feeney *et al.*, 1994). As a caregiver they at times try to provide care and at other times are preoccupied with their own feelings (George & Solomon, 1996).

#### 1.1.3 Avoidant attachment/caregiving

According to George and Solomon (1996) avoidant people can describe themselves as independent of other people. Their caregiving behaviour can be described as rejecting, unavailable (Feeney *et al.*, 1994) and strict (George & Solomon, 1996). People with avoidant attachment can find it difficult to depend on other people,

prefer to be alone and be self-dependent (Feeney *et al.*, 1994). In a relationship, they can show less emotional support to their partner (Feeney & Collins, 2001). An avoidant caregiver can describe her child to be difficult, not willing to respond to the mother's care, at the same time as the mother's involvement in caregiving is relatively low (George & Solomon, 1996). Children of more avoidant parents have been observed to be more distressed during a stressful situation and their parents less responsive to the child's distress (Edelstein *et al.*, 2004).

## 1.2 Studying dog-human attachment

Dogs' attachment behaviour toward their owner might be affected by several factors. Puppyhood maternal care can affect the dog's temperament later in life (Foyer *et al.*, 2016) and the age of the dog might have an influence (Mongillo *et al.*, 2013). Also, breed differences may influence the dog's behaviour (Svartberg, 2003). Apart from genetical and other environmental influences of dog-human attachment, the caregiving style of humans seems to affect dogs' attachment behaviour (Habbe, 2018).

### 1.2.1 Use of attachment style theory in dog studies

The ASSP has been modified to study dog-owner relationship (Topál *et al.*, 1998). Modified ASSP is in dog studies renamed as Strange Situation Test (SST) or Strange Situation Procedure (SSP) (Rehn & Keeling, 2016). Studies reveal that dogs show different patterns of attachment behaviour (Topál *et al.*, 1998). During SSP, dogs have shown more exploring behaviour when owner is present, being more playful and seeking more contact with owner compared with the stranger. According to Topál *et al.* (1998) this shows of a preference of the owner compared with a stranger during SSP and that the dog is using the owner as a secure base in stressful situations.

Surveys investigating dog owners' attachment styles have been related to dog behaviour (Siniscalchi *et al.*, 2013; Konok *et al.*, 2015; Rehn *et al.*, 2017). Significantly more exploring behaviour has been observed during SSP among dogs with owners with a more insecure attachment style compared to owners with a more confident (secure) adult attachment style (Siniscalchi *et al.*, 2013). Dogs with more confident owners have been observed to play significantly more by themselves during the test when the owner is present and be less passive during the presence of the stranger. A higher score for an avoidant attachment among dog owners has been

associated with a higher risk of the dog developing separation disorders (Konok *et al.*, 2015).

#### *Dog mentality assessment (DMA)*

The Swedish Working Dog Association (SBK) is responsible for a dog mentality assessment (DMA) (SBK, 2017a). Subtests from the DMA has been used to study attachment behaviour of dogs during challenging situations (Rehn *et al.*, 2017). It is composed of ten subtests which originally measures the dog's aggressivity, playfulness, sociability, curiosity/fearlessness and chase-proneness (SBK, 2017a), which are traits measured due to their heritability (SBK, 2019). Dog owners' answers on an Attachment Style Questionnaire (ASQ) (Feeney *et al.*, 1994) has been related to the dogs' reaction during challenging situations (Rehn *et al.*, 2017). The stressors used in the study by Rehn *et al.* (2017) were similar to three standardised tests in the DMA; visual surprise (T6), sudden noise (T7) and approaching ghosts (T8), see Table 2. Behaviour differed between dogs having owners with different adult attachment styles. For example, dogs with more avoidant owners were more oriented toward their owner during T6 whereas dogs with more anxious owners were more oriented towards their owner during T8. According to Rehn *et al.* (2017), this can indicate that dogs have different strategies during challenging situations depending on the owners' attachment style.

*Table 2. Summary of the subtest for the dog mentality assessment (DMA) and what they are measuring, modified from SBK (2017a)*

Test (TX)	Trait
T1- Contact	Sociability with strangers
T2- Play1	Playfulness when the owner is around
T3- Object	Chasing or grabbing object
T4- Activity	Activity when human is passive
T5- Play2	Playfulness with a stranger
T6- Surprise	Reaction to a visual surprise
T7- Noise	Reaction to a sudden noise
T8- Ghost	Reaction to slowly approaching threat
T9- Play3	Playfulness with object
T10- Gun	Reaction to gunshot during play and passivity

#### *Studies with Beagles at the Swedish University of Agricultural Sciences*

The caregiving styles secure and disorganised and their impact on behaviour in Beagles in demanding situations has been studied at the Swedish University of Agricultural Sciences (SLU) (Habbe, 2018). How the dogs reacted during separation and reunion were also studied. In 2019 a similar study was performed with Beagles on

SLU applying the two other caregiving styles, insecure avoidant and insecure anxious.

### 1.3 Aim

The main aim of this study was to investigate if there were any correlations between human caregiving styles and the dog's support seeking behaviour, with focus on the insecure avoidant and insecure anxious caregiving style. This part was performed with Beagle dogs owned by SLU, under controlled test situations. Moreover, the adult attachment style (indirect measure of caregiving) of owners of private dogs and their satisfaction of the relationship with their dog was tested for correlations to the dog's behaviour during challenging situations. This latter part was performed using volunteer dog owners and their dog's results from the DMA.

## 2 Method

The study consisted of two parts. A practical study which was a follow up to the study with the Beagles at SLU in 2017 (Habbe, 2018) and by a survey which dog owners who had done the DMA with their dog could fill in.

### 2.1 Practical study: Interactions and behaviour

The practical study was performed at SLU with Beagles which belonged to the university. The procedure was accepted in 2016 by an ethical committee in Sweden (C19/2016). Three female test persons participated in the study. Test person one interacted with all of the dogs, for six dogs with an insecure avoidant caregiving style (CS) and six of the dogs with an insecure anxious CS. Test person two and three interacted with six dogs each, with three dogs as anxious and with three dogs as avoidant. Each dog interacted with one anxious and one avoidant person. The interaction sessions consisted of fifteen 20 minutes-interactions with each person, divided over a period of 33 days. Behaviour tests were done before and after the interaction period, studying the dog's contact or non-contact seeking behaviour towards the two test persons.

#### 2.1.1 Beagles

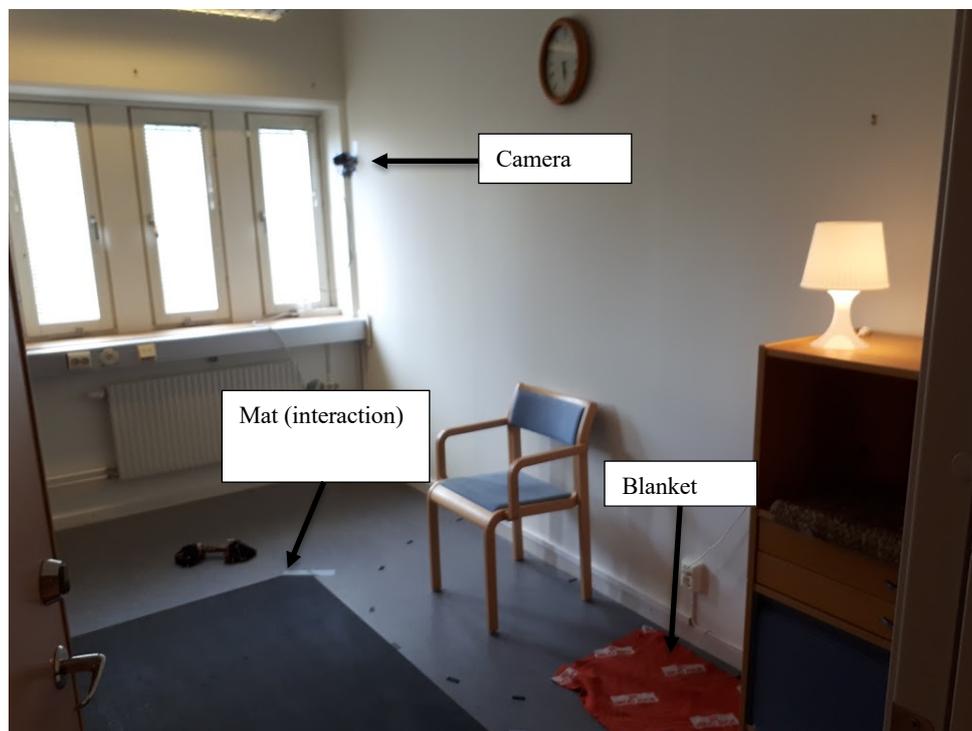
Five males and seven females of the breed Beagle were used in the study. All but three dogs were the same as the ones participating in Habbe (2018). They were between three to eleven years old (mean $\pm$ SE:7.58 $\pm$ 0.93). Two of the males were chemically castrated and one female was castrated. The others were intact. All of them were raised and lived in a similar environment. During daytime, between 8-16 o'clock, they were outside and during the night they were inside. The Beagles lived in groups of four to eight dogs and had access to 145 square meters outside and 24 square meters inside per group. They had regular walks with the caretaker and

student volunteers. Dogs were fed individually with dry food twice a day and *ad lib* access to water.

### 2.1.2 Interaction period

The study design for the interaction period and challenging situations was similar as described in Habbe (2018). In collaboration with a known dog consultant, the CS were adjusted to fit human caregiving of dogs. The interaction period was filmed with one Garmin VIRB XE camera.

Before the interaction period, the dog was walked by the test person from their home to the interaction room, a distance of approximately five minutes. Interaction always took place in the same room (*Figure. 1*) and a similar procedure was applied during every occasion (Table 3). In the room there were a book shelf, a blanket, a mat, a chair, a water bottle and a toy. The room were approximately ten square meters.



*Figure 1.* Room design during the interaction period.

Table 3. Scheme for interaction, modified from Habbe (2018)

Occasion	Time	Explanation
Beginning	Time has not started	Dog and test person enter the room and the dog is unleashed, test person then leaves the room
Away/return	00:00-1:30	Test person starts the clock and returns after 30 seconds. Acting according to CS
Problem-solving	01:30-4:30	Dog is encouraged to seek after candy underneath a mat
Interaction on floor	4:30-9:30	Test person interacts passively with the dog
Play	9:30-11.30	Test person plays with the dog
Passive on chair	11:30-16:30	Test person sitting on chair reading
Passive on floor	16:30-18:30	Passive interaction with the dog
End	18.30	Test person put on leash and leaves the room with the dog

Exception from the scheme in Table 3, was on day three when a sound stressor was applied and on day ten when a stressor in form of a falling object from the ceiling was used (Table 4). The stressors were always applied at the part of the interaction period when the test person was reading on the chair. Fewer stressors were applied during the interaction period compared with the study by Habbe (2018). The interaction period was video-recorded for later observation. Heart rate frequency was measured, however those results are not included in this report.

Table 4. Stressors during the interaction period

Day, stressor	Description
Three, sound	Firework sound during 20 seconds, applied at minute 14:00
Ten, falling object	Stuffed animal falls from the ceiling, applied at minute 14:00

### 2.1.3 Anxious person (ANP)

The behaviour of the anxious person (ANP) was ‘emotional’. ANP behaved stressed when unleashing the dog, acting insecure about if the dog would stay in the room or not when leaving. After returning to the room, ANP (silently) counted to five while walking toward the middle of the room and thereafter reacted with fear toward something in the room. Thereafter turning the attention toward the dog with physical contact and verbally. During the problem solving, ANP encouraged the dog to seek after candy, but also acted worried that something might happen to the dog. During the interaction on the floor, ANP initiated physical contact and called for the dog if it left. ANP sought for the dogs’ attention through eye contact and verbally. During play, ANP acted disappointed with vocalization if the dog did not participate in play and acted worried about the way the dog was playing if it did engage in play. Thereafter, ANP sat on a chair reading a book while occasionally calling for the dog. ANP’s attention varied between trying to get the dogs’ attention and reading the book without noticing the dog. During the final passive period, which was similar for both the anxious and the avoidant person, ANP avoided unwanted eye contact, encouraged the dog in what it did with a calm voice and petting it if it was close by and seemed willing. At the very end, ANP got up quickly from the floor, acting stressed and putting the dog on leash. Then ANP turned off the camera and left the room with the dog.

ANP reacted with fear when the recorded fireworks were played on day three (sound stressor) and got up from the chair quickly. For ten seconds ANP ignored the dog, being preoccupied with her own fear. Thereafter ANP turned the attention toward the dog for ten seconds, acting worried. When the fireworks had stopped after 20 seconds, ANP wanted to be close to the dog for ten seconds and then returned to the chair. ANP acted with fear when the falling object was presented on day ten and got up quickly from the chair. During 20 seconds ANP tried to keep the dog away from the object if it came close and at the same time ANP acted scared. After 20 seconds ANP picked up the object with fear.

#### 2.1.4 Avoidant person (AVP)

Keywords for the avoidant person (AVP) were autonomic and unemotional. AVP commanded the dog to sit and thereafter put on the leash. If the dog did not sit, AVP put on the leash anyway. AVP went to the door, turned around and said “stay” while doing a stop sign. Thereafter AVP left, returned after 30 seconds, then (silently) counted to five while walking toward the middle of the room and thereafter continued to ignore the dog. The dog was pushed away by AVP if it tried to jump or make physical contact. AVP commanded the dog to seek after candy underneath the mat and then remained passive without participating in the play. During the interaction on the floor, AVP acted passive, unwilling to make physical contact with the dog and pushed it/commanded it to go away if it came close. During play, AVP threw the toy. If the dog lost interest in the toy AVP threw it again. The dog was encouraged to play by itself. Thereafter AVP commanded the dog to lie down, while AVP went to get a book and sat on the chair. If the dog tried to make physical contact it was pushed away. Thereafter it was time for passivity on the floor in the same way as for ANP. At the very end, AVP went to get the leash, commanded the dog to come, put on the leash, turned off the camera and left the room with the dog.

AVP ignored the recorded fireworks during day three and did not give the dog any support if it tried to seek contact. At day ten, AVP sighted when the object had fallen to the floor and then looked at the object for ten seconds. Thereafter AVP continued to act passive. After 20 seconds AVP picked up the object and pushed away the dog if it were near the object or AVP.

#### 2.1.5 Challenging situations

In order to evaluate contact-seeking behaviour of the dog according to CS, three challenging situations were presented to the dogs when accompanied by both caregivers. These were: a sudden noise (SN), a visual surprise (VS) and an approaching person (AP). The procedure for the tests was the same during the control and final tests, only that the colour of the visual surprise and the clothes of the approaching person were changed.

All the tests were video-recorded with a front and a back camera (Garmin VIRB XE). ANP and AVP did participate in each test together with the dog they interacted with. All dogs did each of the test before the interaction period (baseline/control) and after the interaction period. Figures which describes the tests are found in Habbe (2018). See Table 5 for the ethogram which was used for the behavioural observations. The dog’s distance to the test persons was observed, as well as position and gaze direction.

Table 5. Ethogram for challenging situations, modified from Habbe (2018)

Group	Class	Explanation
Distance	Near P1	Between 0-5 cm away from P1
	Near P2/P3	Between 0-5 cm away from P2/P3
	Away P1	More than 2 m away from P1, while off leash
	Away P2/P3	More than 2 m away from P2/P3, while off leash
	Leash stretched, P1	More than 1.5 m away from P1, while on leash
	Leash stretched, P2/P3	More than 1.5 m away from P2/P3, while on leash
	Leash slacked, P1	Less than 1.5 m away from P1, while on leash
	Leash slacked, P2/P3	Less than 1.5 m away from P2/P3, while on leash
Position	Unknown	Not possible to observe
	Behind P1	The dog's whole body is behind P1
	Behind P2/P3	The dog's whole body is behind P2/P3
	On the side of P1	The dog is outside P1, any body part ( <i>Figure. 2</i> )
	On the side of P2/P3	The dog is outside P2/P3, any body part ( <i>Figure. 2</i> )
Direction	Unknown	Not possible to observe
	Nose P1	Nose is directed toward P1
	Nose P2/P3	Nose is directed toward P2/P3
	Nose stressor	Nose is directed toward stressor
	Nose stressor, P1 and P2/P3	Nose is directed toward stressor, P1 and P2/P3, when test persons have approached the stressor
	Nose other	Nose is directed somewhere else

P1= test person one, P2= test person two, P3= test person three



Figure. 2. The figure illustrates the position of the dog. If the dog is at the yellow line it is one the side of person one (P1). If the dog is at the purple line, it is on the side of person two/person three (P2/P3). The lines continue to the end of the study area.

### *Sudden noise*

During the sudden noise (SN), ANP, AVP and the dog started walking 15 meters from the stressor, which was a sound created by dragging a chain on a corrugated sheet. ANP and AVP were on one side each of the dog, holding it in one short leash each. When ANP and AVP were one and a half meter from the stressor the chain was dragged over the sheet. When they heard the sound they stopped and dropped the leashes and thereafter were passive. If the dog was five centimetres from or in contact with the stressor the test was over. Otherwise the procedure continued according to Table 6, until the dog had approached the stressor or one minute after the stressor was realized, when the test was finished.

*Table 6. Procedure during the sudden noise (SN), modified from Habbe (2018)*

Time (sek)	Description
15	The anxious person (ANP) and the avoidant person (AVP) walk halfway toward the stressor and stop (0.75 meters)
30	ANP and AVP walk all the way to the stressor and stop
45	ANP and AVP sit down by the stressor and start talking to it
60	Test is finished

### *Visual surprise (VS)*

ANP and AVP started to walk together with the dog on short leashes 15 meters from the visual surprise (VS), which was a wooden board lying down on the ground. When they were two meters from the board, it went up from the ground, from horizontal to vertical. ANP and AVP stopped, dropped their leashes and stayed passive. If the dog were five centimetres from or in contact with the stressor the test was over. Otherwise the procedure continued according to Table 7, until the dog had approached the stressor or one minute after the stressor was realized, when the test was finished.

*Table 7. Procedure during the visual surprise (VS), modified from Habbe (2018)*

Time (sek)	Description
30	The anxious person (ANP) and the avoidant person (AVP) walk all the way to the stressor and stop
45	ANP and AVP sit down by the stressor and start talking to it
60	Test is finished

*Approaching person (AP)*

The approaching person (AP) was an unknown person with sunglasses, a hat and a coat. At the starting point, AP was in a hiding place and ANP and AVP was standing still with the dog between them. ANP and AVP held the dog in one leash each and every leash was two meters long. AP clapped hands three times and thereafter got out of the hiding space. AP walked slowly three and a half meters toward ANP, AVP and the dog and then stopped for five seconds. AP then continued to walk and stop in three and a half meters intervals until AP was four meters from them. ANP and AVP dropped the leashes and stayed passive. If the dog was five centimetres from or in contact with the stressor the test was over. Otherwise the procedure continued according to Table 8, until the dog had approached the stressor or one and a half minutes after ANP and AVP had dropped the leashes, when the test was over.

*Table 8. Procedure during the approaching person (AP), modified from Habbe (2018)*

Time (sek)	Description
15	The anxious person (ANP) and the avoidant person (AVP) walk all the way to AP and stand directed toward AP
30	ANP and AVP talk to AP and AP calls for the dog
45	ANP and AVP stop talking and AP continue to talk to the dog
60	AP takes of sunglasses, hat and the coat and moves five meters from position
75	Test is finished, AP sits down having the side of the body toward the dog as AP calls for the dog

In addition, a separation and reunion test was done before and after the interaction period, as described in Habbe (2018). The results from the separation and reunion test are not included in this report.

### 2.1.6 Processing of data

Behavioural observations were done in the software program Interact (Mangold, Professional, version 17) using instantaneous recordings every second. For AP the starting point was set to when the approaching person clapped hands the first time. The starting point for SN was set to when the noise started and for VS when the board started to leave the ground. The data were processed in Microsoft Excel before statistical analyses took place in Minitab 18 (Minitab Ltd, Coventry, United Kingdom). Mean values for the different behaviours for each dog was calculated. The difference between individual mean values during the final test compared to the baseline test was then used for the Wilcoxon signed rank test, using each dog as its own control. The test calculated the ranks of the median for the different behaviours.

Mean values for differences between the dogs' responses to the caregivers (orientation to and position in relation to person) were calculated. The difference in the dog's mean value for behaviours directed toward the ANP and AVP was calculated, followed by Wilcoxon signed rank tests. Results showing a tendency ( $P < 0.1$ ) or a significant ( $P < 0.05$ ) difference are presented in below.

## 2.2 Survey: Adult attachment style, relationship view and the dog's responses during the dog mentality assessment

Netigate, which is an online survey software was used for the distribution of the survey and collection of answers from respondents. Every dog owner who had performed a dog mentality assessment (DMA) (SBK, 2017a) with their dog could participate. The study had no other restrictions, see Appendix 1 for introduction text to the survey.

### 2.2.1 Questions

The dog's registration number in the Swedish kennel club was used to collect DMA results from an open online site, as well as age and sex. Also, the age and gender of the owner were recorded in the survey. Seven age groups were used, 18-24, 25-32, 33-43, 44-55, 56-66, 67-77 and 77 years or older. The survey consisted of two parts. The first part included questions related to the dog owners' view of the relationship

to their dog (Appendix 2). For example how satisfied the owner was with the relationship, choice of breed and to what extent the dog owner used the dog as social support were included in this part. A scale from one to ten was used.

The Attachment Style Questionnaire (ASQ) (Feeney *et al.*, 1994) was used to measure the owner's adult attachment style. It consisted of 40 statements with a scale from one to six. The scale was from "totally disagree" with the statement to "totally agree". As described in Feeney *et al.* (1994), the answers from the survey can be used to calculate scores for how confident (secure) someone is, as well as their degree of avoidant and anxious adult attachment style.

### 2.2.2 Focus tests

The test results used from the DMA were the visual surprise (T6), sudden noise (T7) and approaching ghosts (T8). These tests had a similar setup as those during the practical study and the intention to use those was to facilitate the comparison of the two studies, in regard to the behaviour of the dog and human perspective of the relationship. The dogs are in every subtest judged by a test leader (TL) on a scale from one to five, with increasing intensity (SBK, 2017a). During the test the owner/handler participate in the test together with the dog, according to the instructions from the TL.

#### *Visual surprise (T6)*

The stressor in the visual surprise (T6) is a pulled up overall (SBK, 2017a). The overall is pulled up suddenly in front of the handler (H) and dog, at a distance of three meters while they are walking toward it. The overall has long sleeves and the sleeves are stretched out when the overall is pulled up.

Visual surprise (T6) is measuring fear (6a), aggression (6b), interest for stressor (6c), remaining fear (6d) and remaining interest (6e) (Table 9). After the overall has been pulled up, the handler (H) drops the leash and remains passive for 15 seconds (SBK, 2017a). Every change in behaviour of H happens in 15 second intervals until the dog has approached the stressor. After being passive, H goes halfway to the stressor. H then approaches stressor and thereafter sits down, start to speak to stressor and calls for the dog. At last H and the dog goes away from the stressor so it can be pulled down. Thereafter they return to the stressor. For this part of the test, 6a, 6b, and 6c are measured. Next part is measuring 6d and 6e. H and the dog start ten meters from the pulled up overall and walk toward it. The dog is walking on the side between the overall and H and they pass the overall and continue to walk ten

meters behind it. Thereafter they return and passes the overall on the other side. The procedure is repeated four times.

*Table 9. Key for the visual surprise (T6) and the sudden noise (T7), modified from SBK (2017a)*

Points	Fear (6a/7a)	Aggression (6b)	Interest (6c/7b)	Fear 2 (6d/7c)	Interest 2 (6e/7d)
1	No stop/short stop	No aggressive behaviour	When overall is down, advances/not advances (6c). Does not advance (7b)	When passing dummy/noise, no change of pace or avoidance	Not interested
2	Stop, hunker down	Some threats	Arrive to stressor when H talks to it and calls for dog	Some difference in pace and speed during one of the passes	Stops when passing dummy/noise, smell/look at it one of four passes
3	Evasive reaction, eye contact is remained	During a longer period, several threats occur	Comes to the stressor when H is there	Difference in speed and pace during first pass, decrease in second	Stops and smell/look at it during two or more passes
4	Escapes <5 m	Occasional attacks and several threats	Arrives when H goes halfway to stressor	Changes for two or more passes, not decreased	Plays with or bites dummy/object during one of four passes
5	Escapes >5 m	Threatful, attacks, might bite	Contacts with no help	Fear/increased fear, all passes	Plays with or bites dummy/object during two or more passes

### *Sudden noise (T7)*

The stressor in the sudden noise (T7) is the sound of a chain dragged over a corrugated sheet (SBK, 2017a). The sound of the stressor lasts for three seconds. A frame hides the chain so the dog does not see when it is dragged.

Sudden noise is measuring fear (7a), interest for stressor (7b), remaining fear (7c) and remaining interest (7d) (Table 9). H walks with the dog on short leash toward the stressor and drops the leash when hearing the sound (SBK, 2017a). Then H stands passive during 15 seconds. Every change in behaviour of H happens in 15 second intervals until the dog has approached the stressor. After standing passive, H walks halfway to stressor. H then approaches the stressor and thereafter sits down,

starts to speak to stressor and calls for the dog. Thereafter this part of the test is finished. In this part 7a and 7b is measured. Next part measures 7c and 7d. H and the dog start ten meters from the sound source and walk toward it. The dog is walking on the side between the sound source and H, they pass the source and continue to walk ten meters behind it. Thereafter they return and pass the source on the other side. The procedure is repeated four times.

#### *Approaching ghosts (T8)*

Approaching ghosts (T8) is measuring aggression (8a), control (8b), fear (8c), interest (8d) and contact (8e) (Table 10). There are two persons acting as ghost in the test (SBK, 2017a). They are wearing white costumes consisting of a top, a long skirt and a hood with holes for the eyes and a horizontal line forming the mouth. H is standing passive with the dog on leash when the two ghosts starts walking towards them. The ghosts walk slowly and stops every three meters. They are starting and stopping according to the TL's signals and stop and turn around after signal from TL. According to instructions from TL, H drops the leash if the dog is close to H. Thereafter H walks two meters toward the ghost who the dog seems to want to approach. The procedure continues until the dog has approached the ghost. After walking two meters and if dog has not approached one of the ghosts, H walks up to the ghosts and stand between them. H thereafter stands face to face with one of the ghosts and then they start talking and H calls for the dog. H takes of the hood of the ghost. If the dog does not approach, one of the ghosts is unveiled and H, the dog and the undisguised ghost go for a short walk together. After the procedure is finished with one of the ghosts, H starts talking to the next ghost and the process is repeated.

Table 10. Key for the approaching ghosts (T8), modified from SBK (2017a)

Points	Aggression (8a)	Control (8b)	Fear (8c)	Interest (8d)	Contact (8e)
1	No aggressive behaviour	Not interested or occasional control	At the side of handler or in front of	Makes no contact or first when the Marshal has no disguise	No contact or avoids contact
2	Some threats	Few looks at ghosts	Some withdrawal. At the side of handler or in front of	When handler calls for the dog and talks to Marshal dog makes contact	Accepts contact, passive behaviour
3	During a longer period several threats occur	Long intervals between making contact/control	At the side of handler or in front of. Alternates between avoidance and control	Dog makes contact together with handler	When Marshal makes contact, dog responds
4	Occasional attacks and several threats	Short intervals between making contact/control with ghosts (both)	Behind the handler. Irregular control and avoidance	When handler moves halfway to the ghosts, dog makes contact	Makes contact with Marshal independently
5	Several attacks and threats	Making contact/control during test (both ghosts)	More than a distance of a leash away from handler, or escapes	Makes contact without support	Intensive greeting of Marshal, dog might jump/whine

### 2.2.3 Distribution

The survey was e-mailed to local clubs within SBK and to breed clubs associated with the organization, for further distribution to dog owners. Social media platforms such as websites and different Facebook groups which had dog owners as their target group, were used for distribution of the survey. The respondents were invited to participate through a link to the survey. The email or the post on social media explained the restrictions of the study and that it was voluntarily to participate. In the beginning of the survey there also was a text describing the study, which also contained contact details to the student and an approximation of the time the respondents have to spend answering the survey (Appendix 1). Answers were collected between March and May 2019.

#### 2.2.4 Processing of data

A score for average secure attachment, anxious attachment and avoidant attachment was calculated for each respondent of the survey, according to Appendix 3. Results from DMA were collected through the registration number of the dogs through SKK hunddata (Svenska Kennelklubben, 2019). Results were used from T6, T7 and T8 in DMA. The data for the survey was processed in Microsoft Excel and thereafter correlations were calculated in SAS (version 9.4, © 2002-2012 by SAS Institute Inc., Cary, NC, USA.)

## 3 Results

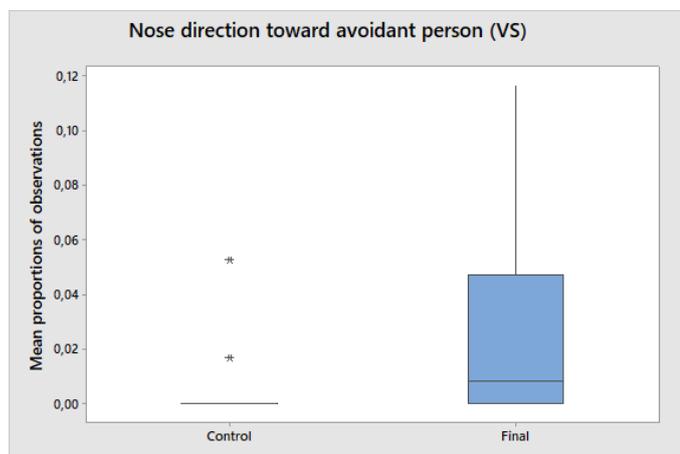
Results for the practical study and the survey are presented below.

### 3.1 Practical study: Interactions and behaviour

Differences in the dog's behaviour between test occasions, between caregivers and the results for the individual dogs are presented in boxplots and tables below.

#### 3.1.1 Differences between test occasions

During VS there was tendency for the dogs' nose being more directed toward the avoidant person during the final test compared with the control test ( $P=0.059$ ,  $W=15$ ) (*Figure. 3*). In AP, there was tendency for dogs being less often close to the avoidant person in the final test compared to the control test ( $P=0.093$ ,  $W=10.0$ ) (*Figure. 4*). No differences were found in SN.



*Figure. 3.* Difference in nose direction toward avoidant person during control test and final test of visual surprise (VS) (\*=outlier).

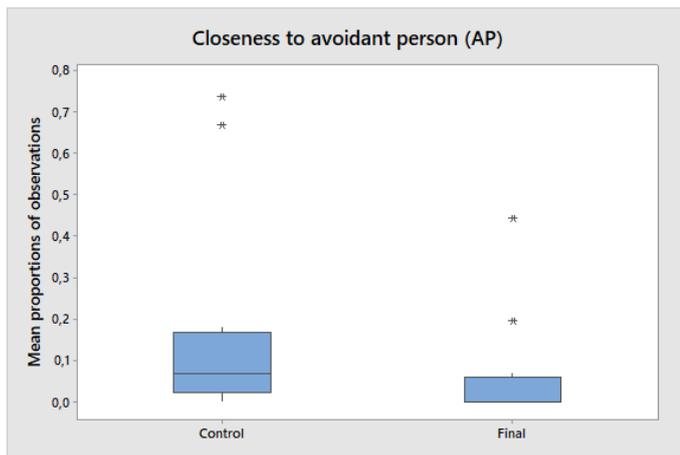


Figure. 4. Difference in closeness to avoidant person during control test and final test of approaching person (AP) (\*=outlier).

### 3.1.2 Differences between caregivers

Differences between caregivers during the control test and final test are presented below.

#### *Control test*

The dogs were more often close to the anxious person than with the avoidant person during the control test of the SN ( $P=0.042$ ,  $W=3.0$ ) (Figure. 5) and dogs were more oriented toward the anxious person than the avoidant person ( $P=0.009$ ,  $W=0$ ) (Figure. 6). Moreover, dogs were more often further away from the avoidant person ( $P=0.036$ ,  $W=21.0$ ) (Figure. 7), and more on the side of the anxious person ( $P=0.022$ ,  $W=0.0$ ) (Figure. 8). There was no significance for the dogs' being more oriented toward the avoidant or the anxious person during the control test of VS or AP.

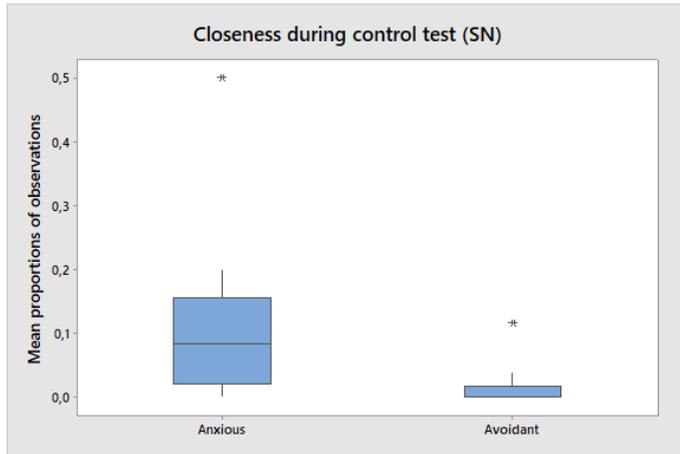


Figure. 5. Difference of closeness to anxious and avoidant person during control test of sudden noise (SN) (\*=outlier).

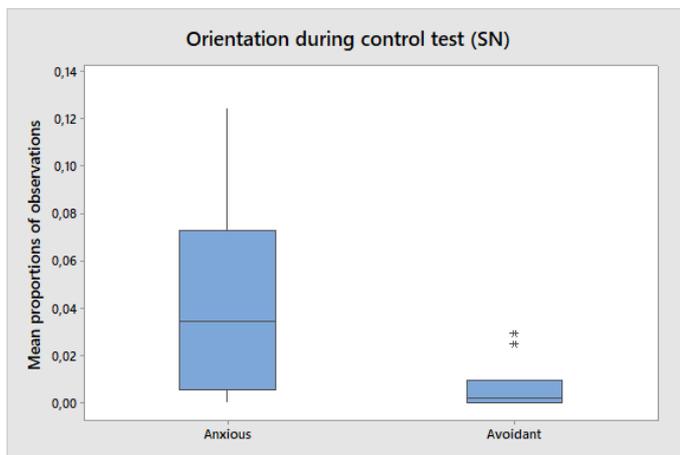


Figure. 6. Difference in orientation toward the anxious and avoidant person during the control test of the sudden noise (SN) (\*=outlier).

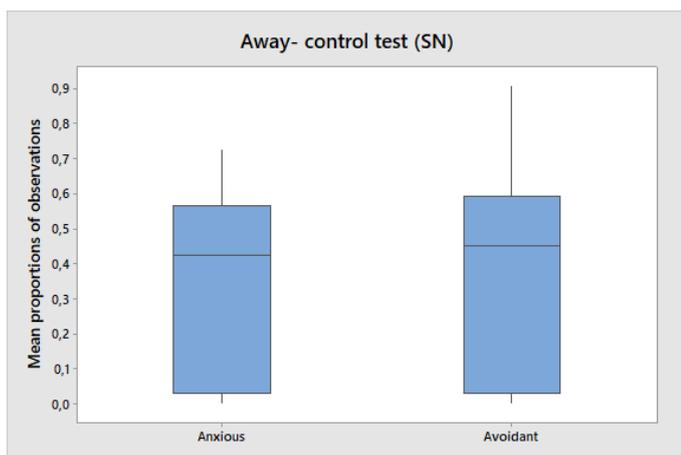


Figure. 7. Difference of the dogs being away from the anxious and the avoidant person during the control test of the sudden noise (SN).

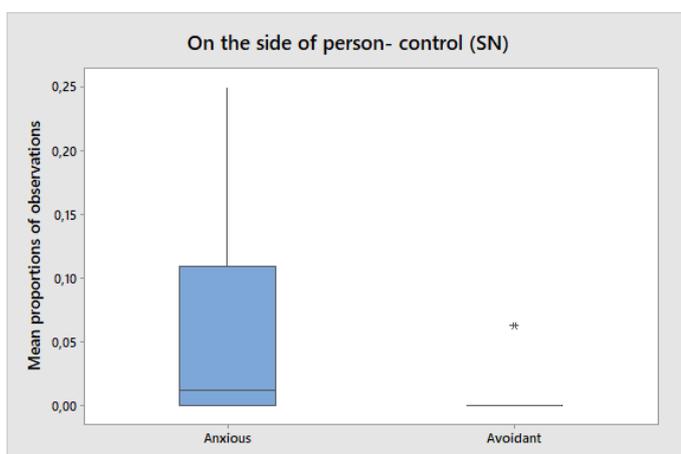


Figure. 8. Difference of the dogs being on the side of the anxious or the avoidant person during the control test of the sudden noise (SN) (\*=outlier).

### Final test

No differences were found in the dog's behaviour towards the caregivers in the final test.

### 3.1.3 Individual dog results

Individual differences for orientation to caregivers is presented in Table 11. A value  $< 0$  indicates a preference for anxious caregiving. A value  $> 0$  indicates preference for avoidant caregiving. Preference for anxious caregiving is marked with yellow, preference for avoidant caregiving with blue and no preference with green.

Table 11. Difference in mean proportion of sample points/test occasion, yellow colour indicates preference for anxious caregiving, blue for avoidant and green indicates no preference

Dog	Control (VS)	Final (VS)	Control (SN)	Final (SN)	Control (AP)	Final (AP)
1	-0.19	-0.27	-0.0042	0.00	-0.17	-0.046
2	0.17	0.17	0.00	0.013	0.0092	0.038
3	-0.0042	-0.013	0.00	-0.0042	-0.057	0.067
4	0.0042	0.0083	-0.038	-0.092	0.018	-0.18
5	-0.0083	-0.029	-0.0083	-0.013	-0.033	-0.0071
6	0.0083	0.20	-0.033	-0.0083	0.022	-0.015
7	-0.13	0.24	-0.075	-0.15	-0.18	0.077
8	-0.0083	-0.0083	0.00	-0.033	0.050	0.0097
9	0.19	-0.063	-0.013	0.058	0.18	0.0014
10	-0.23	0.13	-0.13	0.058	0.18	0.0014
11	0.00	0.013	-0.031	0.029	0.0051	0.0020
12	-0.025	-0.075	-0.10	0.21	-0.018	0.0084

### 3.2 Survey: Adult attachment style, relationship view and the dog's responses during the dog mentality assessment

The survey had n=217 respondents and 92.2 % defined themselves as females. Most of the respondents, 27.7 %, were between 44-55 years old. 23.5 % were between 25-32 years old, 20.7 % were 56-66 years old, 18.9 % were 33-43 and 5.1 % in other age groups. DMA could be identified from 202 of the respondents and 152 of those had a working dog as classified by SBK (SBK, 2017b) and the remaining 50 dogs were of other breeds. A value of anxious attachment could be calculated for 211 of the respondents, of avoidant attachment for 206 and secure attachment for 209 of the respondents.

#### 3.2.1 Questions related to human-dog relationship

Dog owners who were having expectations which were more corresponding to the current relationship were more satisfied with the relationship to their dog (n=217) ( $P < 0.0001$ ,  $R^2 = 0.610$ ) and were thinking the dog was more pleased with their relationship ( $P < 0.0001$ ,  $R^2 = 0.501$ ). Owners' who were more pleased with their choice of breed were more satisfied with the relationship to their dog ( $P = 0.0014$ ,  $R^2 = 0.216$ ) and thought their dog was more satisfied ( $P = 0.0008$ ,  $R^2 = 0.225$ ). Owners who thought their dog was more of a social support for them reported a stronger

emotional bond to their dog ( $P=0.0252$ ,  $R^2=0.152$ ). Owners reporting a stronger emotional bond to their dog were more satisfied with the relationship ( $P<0.001$ ,  $R^2=0.346$ ) and thought that their dog was more satisfied ( $P<0.001$ ,  $R^2=0.324$ ). Owner's believing that their dog had a stronger emotional bond to them viewed their dog more as a social support ( $P=0.0195$ ,  $R^2=0.158$ ), themselves more as a social support for the dog ( $P=0.007$ ,  $R^2=0.228$ ), were more satisfied with the relationship ( $P<0.0001$ ,  $R^2=0.497$ ) and thought their dog was more satisfied ( $P<0.0001$ ,  $R^2=0.448$ ).

### 3.2.2 Sex of dog

There was tendency for owners of bitches to report that their expectations corresponded better to the current relationship ( $n=106$ ) ( $P=0.0529$ ,  $R^2=-0.136$ ), to be more pleased of choice of breed ( $P=0.0515$ ,  $R^2=-0.137$ ) and to view their dog more of a social support for them ( $P=0.0978$ ,  $R^2=-0.117$ ).

### 3.2.3 Dog mentality assessment (DMA)

Dogs which had owners who were more pleased with their choice of breed had a higher score on fear of visual surprise (6a) in DMA ( $n=202$ ) ( $P=0.0319$ ,  $R^2=0.151$ ), fear of ghosts (8c) ( $P=0.0380$ ,  $R^2=0.146$ ) and tended to have a higher score on interest in visual surprise (6c) ( $P=0.0932$ ,  $R^2=0.118$ ). Owners who reported a stronger emotional bond to their dog had dogs with a higher score on aggression against ghosts (8a) ( $P=0.0110$ ,  $R^2=0.179$ ), fear of ghosts (8c) ( $P=0.0114$ ,  $R^2=0.0276$ ) and tended to have a higher score on remaining fear of visual surprise (6d) ( $P=0.0876$ ,  $R^2=0.120$ ).

### 3.2.4 Owners with a more anxious attachment style

Owners' who were more anxious were less pleased with their relationship with the dog today, related to their expectations when buying the dog ( $n=211$ ) ( $P=0.0082$ ,  $R^2=-0.181$ ). Overall, they were less satisfied with their relationship to their dog ( $P=0.0144$ ,  $R^2=-0.168$ ) and thought their dog were less pleased with their relationship ( $P=0.0028$ ,  $R^2=-0.205$ ). Moreover, they were less pleased with their choice of breed ( $P=0.0096$ ,  $R^2=-0.178$ ). More anxious owners tended to think that their dog had a weaker emotional bond to them ( $P=0.0961$ ,  $R^2=-0.115$ ) and thought that their dog was a higher social support for them ( $P=0.0073$ ,  $R^2=0.184$ ).

### 3.2.5 Owners with a more avoidant attachment style

More avoidant owners were less pleased with the current relationship to their dog compared to their expectations (n=206) ( $P=0.0235$ ,  $R^2=-0.158$ ). They were less satisfied with the relationship to their dog ( $P=0.0430$ ,  $R^2=-0.141$ ) and thought that their dog was less satisfied with their relationship ( $P=0.0472$ ,  $R^2=-0.138$ ). More avoidant owners tended to have dogs with a lower score on interest of ghosts (8d) in DMA ( $P=0.0568$ ,  $R^2=-0.138$ , n=193).

### 3.2.6 Owners with a more secure attachment style

Owners with more secure attachment (scoring high on the confidence scale in ASQ), thought their expectations corresponded better to the current relationship (n=209) ( $P=0.0169$ ,  $R^2=0.165$ ) and they were more pleased with their choice of breed ( $P=0.0432$ ,  $R^2=0.140$ ). More secure owners reported a stronger emotional bond to their dog ( $P=0.0157$ ,  $R^2=0.167$ ) and tended to think that their dog had a higher emotional bond to their owner ( $P=0.0711$ ,  $R^2=0.122$ ). They were more pleased with the relationship to their dog ( $P=0.0395$ ,  $R^2=0.143$ ) and were thinking that the dog was more pleased ( $P=0.0015$ ,  $R^2=0.218$ ).

### 3.2.7 Differences between working breeds and non-working breeds

Mean values for avoidant attachment, anxious attachment and secure attachment for the owners of working breeds (WB) and non-working breeds (NWB) (appendix 3) are summarized in Table 12. The mean values are presented on a scale of one to six.

*Table 12. Mean values for attachment style of owners of working breeds and non-working breeds*

Attachment style	Working breeds	Non- working breeds
Secure	4.28 (n=148)	4.22 (n=50)
Avoidant	3.52 (n=144)	3.34 (n=48)
Anxious	2.68 (n=149)	2.85 (n=50)

More anxious owners of WB had dogs with a higher score on interest of sudden noise (7a) ( $P=0.0241$ ,  $R^2=0.185$ ). Expectations were more similar to the current relationship among owners who had WB with a higher score on remaining fear during sudden noise (7c) ( $P=0.0491$ ,  $R^2=0.0301$ ). Owners with WB with a higher score of interest of visual surprise (6c) ( $P=0.0290$ ,  $R^2=0.177$ ) and a lower on interest of sudden noise (7b) ( $P=0.0422$ ,  $R^2=-0.165$ ) were more pleased with their choice of breed. WB with a higher score on remaining interest of sudden noise (7d) had owners which thought their dog had a stronger emotional bond to them ( $P=0.0202$ ,  $R^2=0.188$ ). More avoidant owners had WB with a lower value on interest of approaching ghosts (8d) ( $P=0.0063$ ,  $R^2=-0.227$ ) and more secure owners tended to

have a higher value ( $P=0.0832$ ,  $R^2=0.143$ ). More secure owners had WB with a lower score on contact of approaching ghosts (8e) ( $P=0.0240$ ,  $R^2=-0.185$ ). Persons with WB that had a higher score on interest of approaching ghosts (8d) tended to have a relationship to their dog more as expected ( $P=0.0603$ ,  $R^2=0.153$ ). More secure NWB owners tended to have a lower value on remaining fear of visual surprise (6d) ( $P=0.0963$ ,  $R^2=-0.245$ ).

### 3.2.8 Comments from respondents

Several dog owners were more pleased with the relationship to their dog, than they thought they would be when they bought the dog. Breeders which commented were pleased with the relationship to their dogs. Factors which were not expected were often associated with the dog's mentality. Not having the typical behaviour of the breed, fearfulness, easy to become stressed and not suitable for competing in dog sports were mentioned. Some dog owners did not expect how demanding the dog would be and did not think they had enough knowledge when buying the dog. Personal tragedy or not having enough time, were also mentioned as reasons for not having a relationship that met their expectations. Most respondents were pleased with their choice of breed. Reasons mentioned for not being pleased were: a too demanding breed or a breed not suitable for the owners' ambitions of dog training.

The dogs were described by several owners as being their everything, a member of the family, a good team member or as a best friend. Some respondents mentioned the fact that they spent most of their time with their dog as a reason for their strong emotional bond. Reasons mentioned for dog owners reporting a less strong emotional bond with their dog was personal tragedy or being pleased with having it that way. Several dog owners described themselves as being their dog's everything or as a secure base during demanding situations. Others described their dog as being able to bond to other people, with or without a strong bond to their owner. Reasons for owners thinking that their dog gave them social support were that it made them able to come out and meet new people or made it easier if they struggle with mental illness or other difficulties. Others did not think they needed their dog for social support. Some commented that they did not understand the question. Several commented that they had a confident dog which they did not think needed social support from them. Reasons mentioned for thinking that the dog used their owners for social support were that the dog was being insecure or very attached to its owner. The majority of the owners were overall pleased with the relationship to their dog.

## 4 Discussion

The findings in the practical study and the survey are discussed below. Also, a small comparison between the studies is made. Observations of the dogs' support seeking behaviours toward the different caregivers during the practical study are discussed as well as the correlations found in the survey part. Advantages and disadvantages with the two studies are also discussed.

### 4.1 Practical study

The results of the practical study did show individual differences of preference of caregiver. During the SN control test dogs showed a preference for the anxious caregiver, which can only be explained by coincidence. This because the test persons were acting as different caregivers to different dogs and they did not know beforehand with which dog they would play the different roles. Moreover, there is no possible side bias which can explain the choice of the anxious caregiver during the control test of SN, as the side of each caregiver varied for different dogs and was evenly balanced across the study. During the final test, if the dog preferred the same person as in the control test or not varied. Some dogs preferred the same caregiver in every test and others made different choices. Their preferences might have varied due to different personalities or basic temperament. Even though the dogs were of the same breed which can make the dogs more similar in their behaviour, individual differences in personalities are present within breeds (Svartberg, 2003). It might be suggested that the tests were not enough of a challenge for the dogs, according to the fact that activation of the attachment system and hence, expression of attachment behaviour demands a stressful situation (Ainsworth & Bell, 1970). The dogs who preferred different caregivers during different tests or did not make a choice of caregiver, might therefore not have expressed attachment behaviour due to not being affected by the stressor. Our own impression was that quite a few dogs seemed

unaffected, but that is of course difficult to evaluate without support from e.g. physiological data.

The tendency shown in the results for the dogs' nose being more directed toward the avoidant person during the final test of VS compared with the control test, indicates that the dogs choose the avoidant caregiving style in this particular test. At the same time, dogs were less close to the avoidant person in the final test compared with the control test of AP which suggests the opposite. Nevertheless, those indications are vague and the preferences of caregiving styles according to this study therefore seems to be individual. During the approaching person (AP) in Habbe (2018), a preference for the secure attachment style over the disorganised attachment style was observed. The Beagles were more oriented toward the caregiver with the secure attachment style during AP. While the difference between secure and disorganised caregiving is very large, the difference between anxious and avoidant caregiving (which both are *functional* caregiving patterns in contrast to the disorganised one) is smaller. This might explain why no preferences were found for the avoidant or the anxious caregiver style for the whole group and that preferences instead were being individual.

## 4.2 Survey

As well as an anxious mother can question herself as a caregiver (Feeney *et al.*, 1994), more anxious owners reported being less pleased with the relationship to their dog. More avoidant persons also had a more negative view of their relationship to their dog which corresponded with their view of relationship to other people. Whereas people with a more secure attachment style were more pleased with the relationship to their dog. That more anxious owners believed their dogs were more of a social support for them, might have been due to the fact that people with anxious attachment can have a lower self-esteem and are more insecure about their relationships (Feeney *et al.*, 1994). This result is also in line with a study of Kotrschal *et al.* (2009) who find that more neurotic owners view their dog more as a social support. Higher neuroticism might be associated with a more anxious attachment style, due to the fact that more neurotic owners might experience a greater need of comfort from an attachment figure (Crawford *et al.*, 2007). Nevertheless, the questions about social support might have been read differently by different respondents, according to several respondents mentioning that they did not understand the question. The fear of being abandoned among people with a more anxious attachment style (Feeney *et al.*, 1994) might explain the tendency for more anxious respondents believing their dog had a weaker emotional bond to them. Even though dogs having a

weaker bond to their owner were explained by some respondents by the fact that their dogs were able to bond to several people.

Avoidant owners tended to have dogs which showed less interest in the ghosts during the DMA. This indicates that dogs who had more avoidant owners tended to be more avoidant themselves. According to the result, dog owners which had dogs which were showing more fearful and aggressive behaviour during DMA, reported having a stronger emotional bond to their dog, which is in line with the study of Meyer & Forkman (2014). According to Meyer & Forkman, these results might be explained by the fact that fearful dogs have shown to initiate more contact with their owner which might lead to an experienced stronger emotional bond. They further suggest that the reasons for higher aggressiveness and fearfulness might, on the other hand, be due to the owner experiencing a stronger emotional bond. According to the result of the survey, a stronger emotional bond was correlated to higher scores on secure attachment and no connections were found between more aggressive/fearful dogs and more secure attachment. Therefore, the first explanation by Meyer & Forkman (2014) seems to be more promising according to this study. Tendency for owners of bitches being more pleased with their relationship, breed and experiencing their dog more as a stronger social support for them, indicates that it might be a difference in how owners view their relationship to their dog depending on the sex of the dog. Even though this is vague results.

There were differences in mean values of attachment styles for owners of WB and NWB. Owners of WB were according to these results more avoidant and owners of NWB more anxious and less secure, even though the differences were relatively small. A lower number of respondents gives a lower reliability, especially for NWB owners in this case, whereas the reliability is higher for WB compare to NWB due to more respondents. There were more correlations with DMA for owners of WB than NWB and some behaviours of the dogs were similar to the attachment style of the owner and some were not. WB owners who were more avoidant had dogs which were less interested during the approaching ghosts which is in line with their own attachment behaviour (Feeney *et al.*, 1994). More secure owners had dogs who were less contact seeking during the approaching ghost. This might reflect a higher level of independency or confidence in these dogs.

All correlations presented might not have noteworthy impact of the relationship between dog and human. Low values of  $R^2$  indicates that even the significant correlations might not make a big effect in real life. A value closer to  $\pm 1$  gives a stronger correlation and are more likely to affect the quality of the relationship (or vice versa). According to this study it is not possible to tell whether it is the quality of

the relationship that affects the owner's score on the attachment scales or if it the person's adult attachment style which affects the view of the relationship, i.e. the cause and effect pattern is unknown). Nevertheless, the latter seems more likely as adult attachment style is a quite stable trait. But it is even more difficult to entangle the cause and effect when it comes to correlations between the owner's adult attachment style and the response of the dog in the DMA, as personality of the dog should also be a stable trait. According to our initial hypothesis though, we believe that the environment (or more specifically, the caregiving style of the owner) has an effect on how the dog responds to external challenges.

### 4.3 Comparison of the two studies

During the practical study, the dogs were raised in a similar environment and they were all of the same breed, which gave a more homogenous sample compared to the privately owned dogs in the survey part. Being able to use the dogs as their own control gives the advantage to being able to compare individual change in behaviour between the baseline and final test (and their possible choice between caregivers) while reducing the influence of individual experiences and personality of the study results. Privately owned dogs usually live in different environments and have different experiences compared to research dogs, which might not make these results entirely applicable on companion dogs. On the other hand, using privately owned dogs might require a bigger sample of dogs due to different environments and genetics (Habbe, 2018).

The answers of the survey would have been more reliable with more respondents. A disadvantage with surveys is that it can be read differently. In this survey several people commented that they did not understand questions 4a and 4b about social support (Appendix 2) which might have influenced the results and therefore, these questions would have required a further explanation. Before sending the survey to respondents, it was tried out on test persons to reduce the effect of the survey being read differently.

The purpose with the survey was to get the owners' view of the relationship depending on their own caregiving style and their dogs' behaviour during DMA. The advantage with the survey were that it was an easy way to reach out to many people, without them having to spend much time. In combination with the practical study, this made it possible to study the relationship both from the dog's point of view (indirectly) through behaviour studies and from the human point of view (directly) through questions. This approach makes it possible to get a broader perspective of

how the dog-human bond might be affected and what makes it more successful for both dog and human. Importantly, the measures regarding the dog's response to the stressor were made differently in the practical study and in the survey. In the first case, focus during behavioural observations were made on the dogs' behaviour in relation to the different persons, without trying to measure the level of fear, interest or aggression. In the survey, scores of the dog in the DMA was used, which does not tell anything about how the dog used their owner as a support during the challenges. Hence, direct comparisons of the results from the two parts are impossible to make.

## 5 Future research

Because the challenging situations during the practical study might not have been challenging enough for the dogs it would be interesting to investigate if for example an approaching ‘ghost’ would be more of a challenge. Due to the different preferences of caregiver for the dogs, it would be interesting to compare their personalities with preference of caregiving style, to investigate if there might be any correlations. For example, the sociability and the anxiousness of the individual dogs could be scored on a scale of one to ten, with increasing sociability or anxiousness. The scoring could be done by the dogs’ caretaker, who is not participating in the study as a test person. If the test persons would score the dogs’ personality after interacting with the dogs, their opinions might be influenced by their acted caregiving style. An alternative is to use mean values of the scoring from the two test persons for each dog, to reduce this effect.

A similar study as the survey in this report, with more respondents, would give a higher reliability and this approach would therefore be of relevance to study further. Breed specific comparisons as well as correlations with remaining subtest of the DMA would also be of relevance for further research. Moreover, it would be interesting to observe how the dog is using their owners as a potential source of support in these standardised tests, but that would require more time as an extra observer would need to be present during the DMA. Owners of working breeds and non-working breeds seems to respond differently, although the sample sized differed between owner categories in the current study and there is less data for the owners of non-working breeds. Especially correlations between DMA, caregiving and satisfaction of relationship is interesting to study among working breeds, due to the several correlations in this report and the test being adjusted for those types of breeds.

## 6 Conclusion

These studies showed that dogs showed contact seeking behaviours toward both persons with an avoidant caregiving style and an anxious caregiving style. This might be due to the fact that the dogs' preferences of caregiving might vary, since neither of the caregiving styles was dysfunctional. Furthermore, the survey revealed that human caregiving styles may affect the dog owners' view of the relationship to their dog, which might share similarities with their view of relationship to humans. Behaviour of the dog during the DMA can, according to these studies, affect the bonding between dog and human and the behaviour might be affected by human caregiving style. Further studies are required to investigate what an impact these correlations might have on everyday life for the welfare of dog and human.

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## Appendix- In Swedish and English

### Appendix 1- Introduction to survey

#### Swedish

Mitt examensarbete handlar om eventuella samband mellan människors omvårdnadsbeteende och mentaliteten hos hund. Teorier om omvårdnadsbeteende är hämtade från humanpsykologin. Jag ska även undersöka hundägares upplevelse av relationen till sin hund. Målsättningen är att eventuellt kunna identifiera faktorer som bidrar till en lyckad relation mellan hund och ägare. Denna enkät är en delstudie i mitt examensarbete. Enkäten vänder sig till hundägare som har genomfört MH med sin hund. Personuppgifter kommer att hanteras enligt dataskyddsförordningen. Dessa uppgifter lagras inte och kan inte kopplas till dina enkätsvar. För att delta måste hundens registreringsnummer anges för att mentalbeskrivning ska kunna inhämtas. Din medverkan är helt frivillig, och du kan närsomhelst avbryta din medverkan. Enkäten förväntas ta cirka 20 minuter att fylla i. Den består av kortsvarsfrågor med möjlighet till att lämna ytterligare kommentarer. Frågorna handlar dels om hur du ser på relationen till din hund samt till personer i din närhet. Om du har några frågor om enkäten, går bra att kontakta mig via mejl.

#### English

My master's thesis is about connections between human caregiving behaviour and mentality in dogs. Theories about human caregiving resembles from human psychology. I am also going to investigate dog owner's view on the relationship to their dog. The goal is to identify factors which may contribute to a successful relationship between dog and owner. This survey is one out of two studies in my master's thesis. The target group of the survey is dog owners who have performed DMA with their dog. Personal information is collected according to the General Data Protection Regulation within EU. This information is not stored and will not be connected to your answers. To participate, the dog's registration number in the Swedish kennel club must be mentioned to collect results of DMA. Your participation is voluntarily, and you can at any time interrupt your participation. The survey is approximately 20 minutes long. It consists of questions with short answers and non-mandatory comment sections. The questions are about your view of the relationship to your

dog and to people close to you. If you have any questions about the survey, you are welcome to contact me through email.

## Appendix 2- Questions about dog-owner relationship

1. Mina förväntningar när jag köpte hunden stämmer väl överens med hur relationen ser ut idag/My expectations when I bought the dog corresponds well to how our relationship is today
2. Jag är nöjd med mitt val av ras/I am pleased with my choice of breed
- 3a. Hur starkt känslomässigt band har du till din hund?/How strong emotional bond do you have with your dog?
- 3b. Hur starkt känslomässigt band tror du att din hund har till dig?/How strong emotional bond do you feel your dog has to you?
- 4a. Hur stort socialt stöd är din hund för dig?/How much of an emotional support is your dog for you?
- 4b. Hur stort socialt stöd tror du att du är för din hund?/How much of an emotional support do you think you are for your dog?
- 5a. Hur tillfreds är du med din och din hunds relation?/How pleased are you with yours and your dog's relationship?
- 5b. Hur tillfreds tror du att din hund är med er relation?/How pleased do you think your dog is with your relationship?

## Appendix 3- Calculations ASQ

### Secure attachment

Medelvärdet beräknas utifrån följande påståenden från ASQ/The mean value is calculated according to values from following statements from ASQ (Feeney *et al.*, 1994, pp.493-494).

1. Jag känner mig säker på att andra kommer att finnas tillhands för mig när jag behöver dem/I feel confident that other people will be there for me when I need them
2. Om det är något som bekymrar mig så märker andra oftast det och bryr sig om mig/If something is bothering me, others are generally aware and concerned
3. I stort sett är jag en person som är värd att lära känna/Overall, I am a worthwhile person

4. Jag är säker på att andra människor kommer tycka om och respektera mig/I am confident that other people will like and respect me
5. Jag känner mig trygg i min kontakt med andra/I feel confident about relating to others
6. Jag är lättare att lära känna än de flesta andra/I am easier to get to know than most people
7. Jag har ganska lätt att komma nära andra människor/I find it relatively easy to get close to other people
8. Jag oroar mig ofta för att jag inte riktigt passar in bland andra människor/I often worry that I do not really fit with other people

Svaret på påstående 8 är reversibelt, det vill säga 1 poäng blir 6, 2 blir 5, 3 blir 4 och tvärtom/The answer on statement 8 is reverse, meaning 1 point becoming 6, 2 becoming 5 and 3 becoming 4 and reverse

#### Avoidant attachment

Medelvärde beräknas utifrån följande påståenden från ASQ/The mean value is calculated according to values from following statements from ASQ (Feeney *et al.*, 1994, pp.493-494).

1. Att åstadkomma saker är viktigare än att bygga upp relationer/Achieving things is more important than building relationships
2. Jag tycker att det är jobbigt att behöva vara beroende av andra människor/I find it difficult to depend on others
3. Jag föredrar att hålla mig för mig själv/I prefer to keep to myself
4. Jag oroar mig för att människor ska komma mig för nära/I worry about people getting to close
5. Mina relationer till andra är oftast ytliga/My relationships with others are generally superficial
6. Andra människor har sina problem så jag besvärar dem inte med mina/Other people have their own problems, so I do not bother them with mine
7. Jag tycker att det är svårt att lita på andra människor/I find it hard to trust other people
8. Jag har blandade känslor inför närhet till andra/I have mixed feelings about being close to others.
9. Jag litar hellre på mig själv än på andra människor/I prefer to depend on myself rather than other people

10. Att göra sitt bästa är viktigare än att komma överens med alla/Doing your best is more important than getting on with others
11. Om det är något du ska göra bör du göra det även om någon blir sårad/If you have a job to do, you should do it no matter who gets hurt
12. Om det är något som bekymrar mig så märker andra oftast det och bryr sig om mig/If something is bothering me, others are generally aware and concerned
13. Jag tycker att det är lätt att lita på andra/I find it easy to trust other people
14. Jag känner mig säker på att andra kommer att finnas tillhands för mig när jag behöver dem/I feel confident that other people will be there for me when I need them

Svaren på påståendena 12-14 är reversibla, det vill säga 1 poäng blir 6, 2 blir 5, 3 blir 4 och tvärtom/The answers on the statements 12-14 are reverse, meaning 1 point becoming 6, 2 becoming 5 and 3 becoming 4 and reverse

### Anxious attachment

Medelvärdet beräknas utifrån följande påståenden från ASQ/The mean value is calculated according to values from following statements from ASQ (Feeney *et al.*, 1994, pp.493-494).

1. Jag oroar mig för att andra inte ska bry sig lika mycket om mig som jag bryr mig om dem/I worry that others will not care about me as much as I care about them
2. Det är viktigt för mig att vara omtyckt/It is important to me that other people likes me
3. Jag oroar mig mycket för mina relationer/I worry a lot about my relationships
4. Jag känner mig ofta utanför eller ensam/I often feel left out or alone
5. Ibland tycker jag att jag inte duger någonting till/Sometimes I think I am not good at all
6. Jag oroar mig för att jag inte ska vara lika bra som andra människor/I worry that I won't measure up to other people
7. Jag oroar mig ofta för att jag inte riktigt passar in bland andra människor/I often worry that I do not really fit with other people
8. Jag tycker att det är svårt att fatta beslut när jag inte vet vad andra tycker/I find it hard to make a decision unless I know what other people think
9. Jag undrar hur jag skulle klara mig utan någon som älskar mig/I wonder how I would cope without someone to love me

10. Jag upplever att andra inte vill komma så nära mig som jag skulle vilja ha dem/I find that others are reluctant to get as close as I would like
11. Jag undrar varför människor skulle vilja engagera sig i mig/I wonder why people would like to be involved with me
12. Jag är säker på att andra människor kommer tycka om och respektera mig/I am confident that other people will like and respect me
13. Jag känner mig trygg i min kontakt med andra/I feel confident about relating to others

Svaren på påståendena 12 och 13 är reversibla, det vill säga 1 poäng blir 6, 2 blir 5, 3 blir 4 och tvärtom/The answers on the statements 12 and 13 are reverse, meaning 1 point becoming 6, 2 becoming 5 and 3 becoming 4 and reverse