



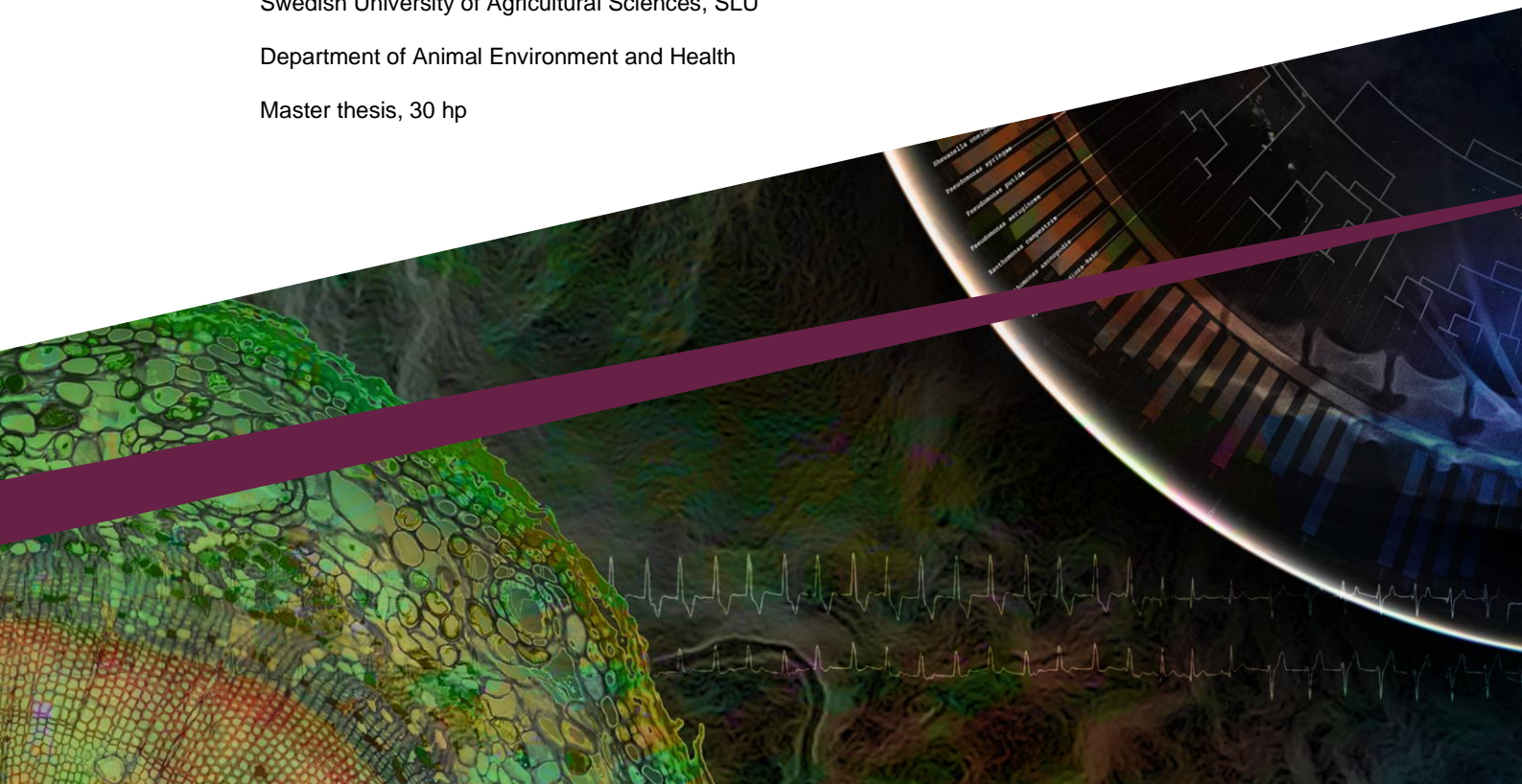
Investigating the reliability of a separation- and reunion test performed on pet dogs (*Canis familiaris*) and their owners

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Master thesis, 30 hp



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Populärvetenskaplig sammanfattning

Hunden har levt nära människan i många decennier och under den tiden har många gemensamma anpassningar till varandra skett, till exempel utvecklat förmågan att förstå varandra och att samarbeta i arbete och vardag. En annan viktig förändring som ägt rum är hundens förmåga att knyta an till sin ägare, vilket visat sig vara liknande som när ett barn knyter an till sin förälder. Ägaren, å sin sida, visar liknande behov av att ta hand om sin hund som en förälder mot sitt barn.

För att studera hur föräldrarnas omvårdnadsbeteende påverkar hur barnet knyter an, togs det fram ett test (Ainsworth's Strange Situation Procedure) som bland annat innebar att barnet lämnades ensam av sin förälder i ett främmande rum. Man ville se vilka typer av närhetssökande beteenden barnet uttryckte under själva lämnandet, separationen och sedan återföreningen med föräldern och koppla det till föräldrarnas respons på barnets närhetssökande beteende. Denna procedur har sedan lånats över till hundforskningen, men hur tillförlitlig denna metod är på anknytningsstudier på hund har aldrig utvärderats. Det har alltså funnits en risk att hundens och/eller ägarens beteende ändras avsevärt beroende på faktorer som dagsskick eller väderförhållanden. I så fall skulle testet inte säkert kunna säga någonting om anknytning och relation.

Därför valde vi att utföra testet på 15 hundar och deras ägare, vid två olika tillfällen, med förhoppningen om att paren skulle bete sig ungefär likadant under de båda tillfällena – vilket bekräftades. Exempelvis, de hundar som gnällde och skällde när de lämnades ensamma gjorde det i ungefär samma utsträckning, och de ägare som pratade mycket med sina hundar under återföreningen gjorde det ungefär lika mycket under båda testen.

Vi passade också på att undersöka eventuella samband mellan hur ägarna knyter an till andra vuxna i sin närhet mot utförda beteenden i testerna och hur ägaren ser på och värderar relationen till hunden, samt hundens temperament. När vi korrelerade ägarens vuxna anknytningsstil mot hundens temperament (beskrivet av ägaren) fick vi fram att hundar till mer ängsliga ägare var mer rädda för till exempel höga ljud eller främmande platser och hade i större utsträckning separationsångest, medan hundar till ägare som inte var särskilt ängsliga ansågs mer kontaktsökande. Hundar till ägare som var mer undvikande i sitt sätt att knyta an till andra var mer hundaggressiva och därtill känsliga mot fysisk kontakt, medan aggression mot ägaren främst visades mot de som inte var särskilt undvikande. Vid själva beteendetesterna kunde vi se att mer ängsliga ägare hade hundar som tittade mer på dem och höll sig nära i stället för att utforska det främmande rummet när ägaren höll på att lämna rummet. Att utforska rummet under denna fas hade däremot en koppling till att ägaren rapporterade en starkare känsla av emotionell närhet till hunden. Under själva separationsfasen sågs hundar till mer ängsliga ägare gnälla och skälla mer, och hundar som beskrivits av sina ägare som att vara kontaktsökande i vanliga fall och även under testet tittade mycket på den stängda dörren, vilken ägaren hade försvunnit igenom. Här kunde också mer utforskande kopplas till att ägaren beskrivit att hen spenderade mycket tid tillsammans med hunden till vardags, där till exempel ägaren tar med hunden på bilturer eller besöker vänner. Slutligen, under återföreningsfasen, tittade hundarna inte lika mycket på ägare som skattats som mer undvikande och spenderade i stället sin tid med att utforska rummet (det vill säga undvikande möts av undvikanderespons). Dessa ägare

pratade inte särskilt mycket med sina hundar under testet och sökte inte heller särskilt mycket, om någon, fysisk kontakt med sin hund.

För att sammanfatta studien i sin helhet kunde vi med detta konstaterade att anknytningsrelaterade beteenden i samband med separation och återförening inte påverkas av dagsform eller miljö och metoden kan därmed anses tillförlitlig. Vi uppmuntrar nu till vidare studier inom anknytningsteorin och relationen mellan ägare och hund!

Abstract

Our long mutual history together with the dog (*Canis familiaris*) has influenced health, physique, wellbeing, as well as behaviour – on both parts. Today, we refer to dogs as family members rather than working tools. Previous research has shown that a dog and its owner show similar attachment behaviour towards each other, as would a child and its parent. The urge to express attachment behaviour is said to be activated by stress, e.g. during and after a separation from each other. Therefore, separation and reunion are commonly used when evaluating the relationship quality. However, this method had not yet been evaluated for its reliability (or trustworthiness), which this study aimed to correct. Nor has its validity been studied (whether the test actually measures what it is supposed to measure). This, however, was only briefly investigated due to a small sample size.

Fifteen dogs and their owners participated in a separation- and reunion test at two separate occasions each, consisting of a departure phase (the owner leaves the dog), separation phase (the dog is alone for three minutes), and a reunion phase (the dog and owner reunites for three minutes). As an attempt to initiate a validation of the test, the owners answered four different questionnaires regarding their adult attachment style (how they bond and interact with other people), their relationship to their dogs, and their dogs' personalities. The adult attachment style scores of the owners were then correlated to their owner-dog relationship scores, the dog temperament scores, and owner and dog behaviour in the separation and reunion test.

The results showed no difference in behaviour between the two tests, indicating that daily conditions or mood did not affect the behaviour of the dog nor the owner during the test scenarios. There was a correlation between owners being more anxious and dogs paying more attention to and staying close to them when the owners were leaving the room during the test. These dogs also explored less. When alone, owners that were more anxious had dogs that whined or barked more often during separation. During the reunion phase of the test, more avoidant owners did not talk much to their dogs and in return the dogs paid less attention to them and did not initiate much physical contact, but instead explored the room. Regardless of owner adult attachment style, dogs that scored high on attention seeking in the C-BARQ paid more attention towards the door during separation. In addition, owners who considered themselves emotionally close to their dogs in the MDORS had to a larger extent dogs who explored the room both during departure and reunion in the test. Emotional closeness also correlated positively to owner and dogs spending a lot of time together on a daily basis (MDORS). We can only speculate, but the results may indicate that dogs owned by more anxious owners are more sensitive to external challenges that many dogs are exposed to, such as meeting unfamiliar people, being in a novel environment, being left alone, etc. Dogs having more avoidant owners may be less dependent of their owners or having different strategies to cope with stressors as compared to if the dog instead had a more anxious owner.

In conclusion, we can consider this method as being reliable for use in the study of dog and owner interaction and relationship quality. Moreover, results indicate that the test is valid, based on the associations between questionnaires and the behavioural test, but these results should be interpreted with caution as the sample size was small and because it was difficult to identify a proper measure to check validity against (i.e. a comparable template).

Keywords: ethology, anthrozoology, separation, reunion, ownership, dog, behaviour, attachment

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Abbreviations

AS	Attachment style
AAS	Adult attachment style
CS	Caregiving style
SSP	Strange situation procedure
ECR	Experiences in Close Relationships Scale
ASQ	Attachment Style Questionnaire
MDORS	Monash Dog Owner Relationship Scale
C-BARQ	Canine Behavioural Assessment and Research Questionnaire

1. Introduction

The dog (*Canis familiaris*) has been integrated into the everyday life of most humans for, as far as we know in this writing moment, around 15 000 years (Savolainen et al., 2002). This is regarded as the start of the domestication process. Before this, 25 000-50 000 years ago, a period of proto domestication is argued to have taken place, where a few numbers of wolves started to live close to humans without the forming of genetic adaptations (Germonpré et al., 2009). Because of our long mutual history, there is no wonder that dogs today develop a large amount of the same physical diseases as their owners do such as diabetes, allergies, or cancer but also mental disturbances like obsessive-compulsive disorder or separation anxiety (e.g., Konok et al., 2015). In addition, the across-species communication has been cultivated. When facing an unsolvable puzzle, dogs turn to their owners for assistance – something their ancestors do not do to the same extent (Gácsi et al., 2005). Another important adaptation is the dog's ability to form an attachment to its owner. It has been shown that dogs form similar attachment behaviours to their owners as children do to their parents, and likewise, the owners may show similar caregiving behaviours towards their dogs as they would towards their children (Topál et al., 1998). In fact, owners often regard their dog as a family member rather than a family dog (Albert and Bulcroft, 1987). It is this study of attachment in dogs this thesis will mainly focus on.

Attachment lies upon three main components: proximity seeking and separation distress, safe haven, and a secure base. During separation from the owner, the dog may seek proximity by vocalising and standing close to the door and when reunited again immediately seeking contact (Topál et al., 1998). During reunion, the dog may display various degrees of lip licking, body shaking, vocalising and tail wagging (Rehn and Keeling, 2016), which may indicate positive arousal during greeting (Rehn et al., 2014a). These varying frequencies and attributes depend on how the owner initiates contact (Rehn et al., 2014a). In one situation, when the owner only initiated verbal contact, the dog vocalised more (contact seeking) and expressed more tail-wagging (positive arousal and contact seeking; Rehn et al., 2014a). On the other hand, when the contact was verbal as well as tactile, the dog expressed a higher frequency of lip licking, which is suggested to be a common greeting signal between canids (Smith et al., 2011) and is generally a sign of affection and positive arousal (Rehn, 2011) rather than submission (Smith et al., 2011). If ignored by their owners during reunion, the dogs ignored their owners in return, and instead investigated the surroundings or rapidly redirected their contact seeking behaviour towards another person (Rehn et al., 2014a).

The reunion between individuals has a bond strengthening effect (Smith et al., 2011) and because of this, the greeting procedure after a separation may help maintain and build on the quality of the owner-dog relationship. Meaning that the greeting behaviour is not only dependent on the quality of the relationship, but the quality of the relationship may be dependent on the duration and components of the greeting form.

1.1. Attachment theory and Ainsworth's strange situation procedure

Attachment theory was first introduced by Bowlby (1958), describing a child's preference for an adult individual, and displaying distress when separated from her. This portrays a need to be near this person, the attachment figure, a bond that is consistent over time and space (Ainsworth and Bell, 1970). This means that when attachment has been established, it is maintained, despite longer periods of separation. Behaviours signalling this need of proximity can be approaching, following, clinging, smiling, crying, or calling and the secure caregiver respond to these signals, showing a corresponding urge to take care of and protect the attached youngster (Ainsworth and Bell, 1970). The caregiver is providing a secure base from which the

child can proceed in its adventurous advancements, but at the same time act as a safe haven to return to when facing potential (real or perceived) danger (Bowlby, 1982).

The attachment system is activated during and after a longer or shorter involuntary separation, making it a suitable situation to use when studying attachment between caregiver and care recipient (Ainsworth et al., 1978). Ainsworth and Bell (1970) created the “Strange Situation Procedure” (SSP), to be able to study attachment in an experimental setting. They investigated the level of locomotion, manipulation of objects and visual exploration with the main caregiver present, absent, present with a stranger, and the child alone with a stranger. The findings suggested that the exploratory behaviours decreased when the attachment figure was absent and/or if a stranger was present (Ainsworth and Bell, 1970). In addition, they saw that the incidence of crying increased significantly when the caregiver left the room, to decrease upon her re-entry, only to increase again for her second departure (Ainsworth and Bell, 1970). Children were more easily frightened of stimuli without the attachment figure present and in some cases the motivation for proximity, because of this, was so high that the toddler even accepted comfort from a stranger (Ainsworth and Bell (1970). Similar responses (proximity seeking towards owner, separation distress and comfort received by owner presence) have also been observed in dogs experiencing high levels of separation despair (Topál et al., 1998; Rehn et al., 2014a). In addition, some dogs vocalise more than others during the SSP, both when owner and/or stranger are present in the room, which might indicate that the owner in these cases failed to provide a secure base for the dog in the strange situation (Siniscalchi et al., 2013). In other cases, children looked away and held distance to both stranger and caregiver (Ainsworth and Bell, 1970). Furthermore, the presence of a caregiver generally affects whether or not the attached individual, dog or child, has any desire to explore or participate in play in an unfamiliar environment (Ainsworth and Bell, 1970; Siniscalchi et al., 2013; Topál et al., 2013). It has therefore been argued that dogs show similar attachment related behaviours in the SSP as would a child).

The varying responses in the SSP indicates that attachment in fact is not uniform, but rather dependent on previous experiences and associations. What kind of behaviour the attached individual displays varies due to the quality of caregiving it is provided with, i.e., what caregiving style (CS) the attachment figure has (George and Solomon, 1996). Similarly, the level of response from the caregiver differs depending on its previous experiences as a child – its own attachment style (AS; George and Solomon, 1996). If the child does not get a response when showing proximity seeking signals, its signalling may increase (hyperactivation of the attachment system) or decrease (deactivation of the attachment system). Non-responsiveness can increase the proximity-seeking behaviour up to a point where the child instead starts distancing itself from the parent to avoid psychological pain (Mikulincer and Shaver, 2007). Independence may be so highly rewarded by the parent that distancing becomes the default behaviour of the child. The method for gaining proximity to the caregiver may differ between individuals, but the urge or goal of being near and protected does not (George and Solomon, 1996).

Moreover, being sensitive to what kind of support the attached individual seeks is of great importance and is a factor contributing to how the caregiving style is interpreted. Misinterpretation of signals may contribute to the sense of intrusion, e.g., into a task that the child wished to solve on its own – causing frustration and a feeling of being misunderstood or disrespected rather than creating a secure base (Collins et al., 2006). This has also been studied in dogs in a thesis work by Fahlgren (2019). In her study, the test person would, e.g., “force” play by being very energetic with a toy in front of the dog, even though the dog did not signal an urge to participate in the playful interaction (Fahlgren, 2019).

A child who has been taught appropriate communicating skills early (i.e., parent responding to proper signals from the growing child in a variety of situations), becomes better

at communicating needs as an adult, and has an enhanced ability and willingness to care for others (Mikulincer and Shaver, 2007). Therefore, one's adult attachment style (AAS), i.e. how the grown-up child generally views relationships and how it interacts with its closest people, also spreads light on its juvenile attachment and its presumed present or future caregiving style (George and Solomon, 1996). In dogs, however, attachment throughout life has not been studied related to e.g. rehoming and early life experiences.

1.2. Attachment, adult attachment, and caregiving styles

The following attachment and caregiving styles are commonly used when studying this subject, based on if the parent can provide a secure base; the level of rejection of a child's needs in favour of one's own; uncertainty about how the caregiver perceives herself; and the feeling of helplessness and being out of control (George and Solomon, 1996). These characteristics are measured on a continuous scale, i.e., a person is not put in a strict category but rather described as more or less of either.

Adults with a more *secure* AAS easily get close to other people and feel comfortable being reliant on them (Mikulincer and Shaver, 2007). As caregivers, regarding their CS, they are sensitive to the child's needs, accepting and psychologically available (Ainsworth et al., 1978) and adjusts the type of caregiving as the child develops and mature (Solomon et al., 1987). For example, they are allowing investigation or play on its own or with other children, but if a threat raises, child and parent are quickly reunited (Ainsworth and Bell, 1970). When the child is facing a problem, the parent is warm, supportive, and helpful (Mikulincer and Shaver, 2007). Before separation, secure caregivers show more affection towards their children as to prepare them for the separation. They are not (or very little) anxious when leaving the room and directly ensures proximity when reunited again. The child typically signals distress during separation, then actively and joyfully greets her when reunited (turns to a safe haven), and quickly calms down to return to play (Primary attachment strategy; Mikulincer and Shaver, 2007; Topál et al., 1998). This latter is an indicator of using the parent as a secure base. Persons with a more secure AAS/CS shows a good balance between dependence and independence (trusting the caregiver and trusting oneself) and therefore provides high welfare for the care recipient.

Adults with a more *unsecure avoidant* AAS feel uneasy being close to others and trusting them. A caregiver with an avoidant CS is rejecting and psychologically unavailable towards the child (Ainsworth et al., 1978) and, when assisting the child during a task, she is controlling and task-oriented (Crowell and Feldman, 1989) rather than supportive. She encourages independence to a high degree and displays no distress when separated (Mikulincer and Shaver, 2007). Typically, the child displays limited amount of hardship when separated and actively ignores her during reunion (Ainsworth et al., 1978), due to this response having been the most successful strategy to receive the most positive attention by experience (deactivated attachment strategy; Mikulincer and Shaver, 2007). More emphasis is put on independent behaviour which is functional in the current relationship but may impair child or dog welfare due to a lack of trust in the caregiver.

Adults with a more *unsecure anxious/ambivalent* AAS experience fear of abandonment and is often described by others as being clingy (Mikulincer and Shaver, 2007). As caregivers they show uneven responsiveness to proximity seeking signals (Ainsworth et al., 1978). The child's low-intensity signals may be ignored, making the child increase the intensity of the signalling up to a point where they are acknowledged (Mikulincer and Shaver, 2007). Anxiously attached individuals exaggerate the proximity seeking signals in hopes of getting a response when doing so. Thereto, as the child develops, the caregiver is unresponsive to the child's need for independence (Solomon et al., 1987). He/she shows an alteration between

positive and negative thoughts regarding interactions with the child, which corresponds to an ambivalent behavioural response from the child (George and Solomon, 1996), and so, a spiral is created. When helping the child with a task, the caregiver often shows anxious behaviour (Eiden et al., 1995), they give confusing instructions (Crowell and Feldman, 1989), and interfere during the problem-solving (Adam et al., 2004). Upon separation, the anxious caregiver shows high anxiety and has a hard time leaving the child. The child shows great distress during separation as well, and is contact seeking upon reunion, but is not calmed by the presence of the caregiver (hyperactivated attachment strategy; Mikulincer and Shaver, 2007; Topál et al., 1998). More emphasis is put on dependence of the caregiver (proximity seeking), which is functional in the relationship but may impair child or dog welfare due to high reliance on the caregiver and lack of self-trust.

Lastly, a person with a *disorganized* AAS may rapidly shift between hyperactivating or deactivating the attachment system when seeking affection from a partner (Mikulincer and Shaver, 2007). Their CS is characterised by being extremely unresponsive to signals, a lack of sincerity when comforting the child, and being unable to select or modify the appropriate behaviour for a certain situation (Main and Solomon, 1990; George and Solomon, 1996). Like the parent, the attached child does not have a clear strategy to claim proximity but may shift between the other two insecure strategies, or “does something bizarre, such as lie face-down on the floor without moving when their mother appears following a separation or sit passively under a table, evincing no clear proximity-seeking strategy at all” (Main and Solomon, 1990). According to Schuengel et al. (1999), when being fearful of the behavioral unpredictability of the caregiver, the infant may adapt a disorganized attachment style due to not being able to integrate fear and attachment onto one person. Disorganized caregiving or attachment is significantly related to childhood violence or abuse (Lyons-Ruth and Block, 1996).

However, even though there often seems to be a strong connection between caregiving and attachment style, they are not always reflections of each other (Ainsworth and Eichberg, 1991). Although having a more insecure attachment style growing up, a person can begin to function in a more secure manner through psychotherapy or new experiences of secure and trusting relationships (Mikulincer and Shaver, 2007).

Attachment between child and parent ensures survival of the offspring, but attachment between dog and owner do not have this kind of biological relevance (e.g. fitness). We are different species with different languages and therefore simply lack a natural tendency to understand one another. Because of this, specific knowledge about attachment and caregiving is required from the owner. The theory of attachment in humans have been directly applied in the studies of attachment between the dog-human dyad, *without expecting exactly the same patterns* in the dog-owner interactions as seen between child and parent. To this day, little is known about attachment styles in dogs. However, Sinicalchi et al. (2013) investigated how the owners' attachment style correlated to the owner-dog bond using the SSP and found evidence for such associations. Cimeralli et al. (2016) found that owners scoring high on “owner warmth” to larger extent had dogs seeking proximity to them rather than an unfamiliar person during a threatening situation. In addition, it has been showed that dogs may develop certain categorical strategies to cope with stressors based on the kind of support received from the owner (Rehn et al., 2017).

To further complicate the translation of these human theories, there are several other factors besides the CS of the owner affecting attachment behaviours in dogs. Dogs living in a large household, e.g., may behave more passively during both separation and reunion, with the possible explanation that in families with several owners, the dog can form several attachment bonds and in turn displays less clinging behaviour towards a particular owner during reunion (Topál et al., 1998). In this case, the owner CS fail to correspond to the dog's AS.

1.3. The aim of this study

Due to the activating effect separation has on attachment behaviours, separation and reunion studies can provide a valuable “snap-shot” of the relationship between dog and owner (Rehn and Keeling, 2016). Interestingly, the method itself has not to this day been evaluated for its reliability (if it is dependable or trustworthy) and validity (its ability to accurately describe the reality, i.e., if it really measures what it is supposed to measure) when measuring the quality of attachment between dog and owner.

The aim of this study was to investigate whether the method commonly used when assessing attachment between a dog and its owner is reliable. In this case, reliability is closely related to repeatability since this was done by carrying out two identical separation- and reunion tests on two different occasions. The hypothesis was that there would be no significant difference in behavioural repertoire for each individual dog or owner. A lack of difference in this matter, would indicate that the behaviour of the dog during separation and reunion from its owner is not, in general, affected by changes in daily body or environmental conditions.

In addition, we examined whether the owner’s AAS reflected the test results, and therefore touching upon the validity of the test, by letting the owners answer two standardised questionnaires about their relationship to other adults (an indirect measure of CS). Moreover, the owners received standardised questionnaires about the dog’s temperament and their own view of the relationship with their dog, since personality and temperament might influence the behaviours shown in a separation- and reunion scenario – not necessarily connected to attachment. To date, we do not know how different attachment pattern looks in dogs, neither do we know how owner caregiving nor dog temperament (genetic heritage) may affect the development of these patterns. Because of this, there is no template or right answer to validate the test against, but this was a first attempt to investigate this.

2. Method and materials

The study consisted of two identical tests, with 28 days in between (except for one dyad, where the period between tests was 42 days, due to owner health issues). The tests focused on the dog's and the owner's behaviour before, during and after a short separation. In addition, the owners answered four questionnaires providing information about their adult attachment styles (as an indirect measure of caregiving), dog temperament (everyday behaviour as described by the owner), and owner view of the relationship with the dog. Since the testing was performed on privately owned dogs, was non-invasive and considered as non-harmful both physically and psychologically for the dogs, no ethical permit was needed to conduct this study (7 chap. 2§ and 9§ The Swedish animal welfare act 2018:1192). However, all owners gave their informed written consent for participating in the study and regarding our use of their personal information (regulated through EU's General Data Protection Regulation, GDPR). Moreover, the owners could choose to terminate their participation at any time, without further explanation.

2.1. Participants

Fifteen privately owned dogs of different breeds, ages, and sexes were included in the study (table 1). Two of the human participants were regular dog sitters to the corresponding participating dogs, who lived in the same environment as the dog but was not the actual owner. Note that hereafter in this report, the attachment figure will be referred to as the owner, even though not all dogs were tested together with their owner. Due to the overall calming effect the presence of a human generally has on puppies, a stress reduction when reunited might not reflect an actual attachment bond to that person (Pettijohn et al., 1977). Therefore, the dogs tested in this study had reached at least 1 year of age (mean $5.87 \pm SD 0.57$ years old).

The dogs consisted of 6 females and 9 males. All owners except three were females. See table 1 for participant characteristics and the distributions between the rooms (rooms were balanced; half of the dogs were first tested in room A then B, the other half was first tested in room B then A). One of the dogs had issues with separation from its owner, but since separation was the only hardship provided in this study and during a very limited time, we concluded together with its owner that the test would not cause unnecessary suffering to the dog. No other participating dog was reported by their owner to have any problems with this kind of challenge. The setup of this study was therefore considered ethically acceptable.

Table 1. Participant characteristics and room distributions.

		Owner		Dog		
Room test 1	Room test 2	Sex	Relationship to dog	Breed	Age (years)	Sex
A	B	Female	Owner	Shetland sheepdog	4	Female
A	B	Female	Owner	Mixed	8	Female
A	B	Female	Owner	Mixed	9	Male
A	B	Female	Owner	Border collie	3	Male
A	B	Female	Owner	Collie	3	Male

A	B	Female	Owner	Mixed	6.5	Male
A	B	Female	Owner	Miniature pincher	8	Male
A	B	Male	Owner	Miniature schnauzer	7	Female
B	A	Female	Owner	Shetland sheepdog	5	Female
B	A	Male	Regular dog-sitter	Cavalier king Charles spaniel	4	Female
B	A	Female	Owner	Golden retriever	6	Female
B	A	Male	Regular dog-sitter	Golden retriever	4.5	Male
B	A	Female	Owner	Shetland sheepdog	4	Male
B	A	Female	Owner	Welsh corgi	6	Male
B	A	Female	Owner	Jack russel terrier	10	Male

2.2. Separation and reunion test

Dogs were introduced to an unfamiliar room together with their owner. The behaviour of both dog and owner was observed throughout the test, beginning with the owner leaving the dog in such a way he/she usually would in a similar situation (including potential calming words, cuddles, or commands). The aim was to mimic the normal interactions of the dyads in this kind of setting, i.e., separation and reunion in unfamiliar environments. During the period of separation, the owner was asked about how she was feeling regarding leaving the dog alone in the unfamiliar room and the answer was noted. After 3 minutes, the owner re-entered the room and the reunion ceremony between owner and dog was observed during an additional 3 minutes. See fig. 1 for timeline of the entire test. The owner was instructed to greet the dog in the same manner as he/she usually would.

The procedure was recorded using two CANON Legeria HF R68. The test was repeated after 28 days for all dyads but one (42 days). Each dog was tested in another room, which as located in the same building, in the second test. The distribution of dogs and rooms were balanced over dogs, i.e., half of the dogs were tested in room A the first time and in room B the second time, and *vice versa* (see table 1).

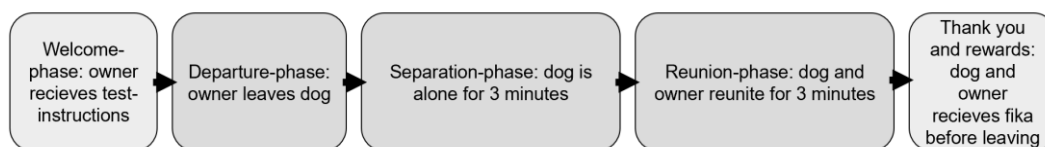


Figure 1. Timeline over the separation- and reunion test.

2.2.1. Room descriptions

The rooms were decorated with sinks, a shelf, three tables and a water bowl. Two areas in both rooms were closed off by gratings, inhibiting the dog from being there (due to an inability to capture these areas with the video cameras). See fig. 1 and 2. for further clarifications. The

rooms were cleared out of any objects that could potentially harm the dogs, to reduce risk factors if a dog would become overly anxious or adventurous when alone.

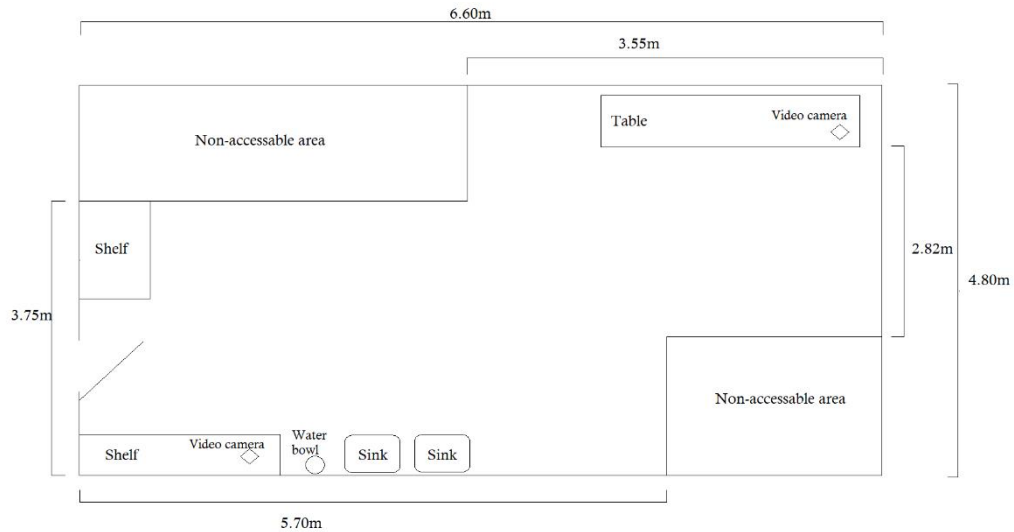


Fig. 2. Measurements and fittings for room A. Half of the dogs were tested here during test 1 and the other half during test 2. The non-accessible areas were sealed off using compost fences. The owner was instructed to behave as it usually would in a similar situation. Therefore, the owner did not have to stand in a specific place in the room.

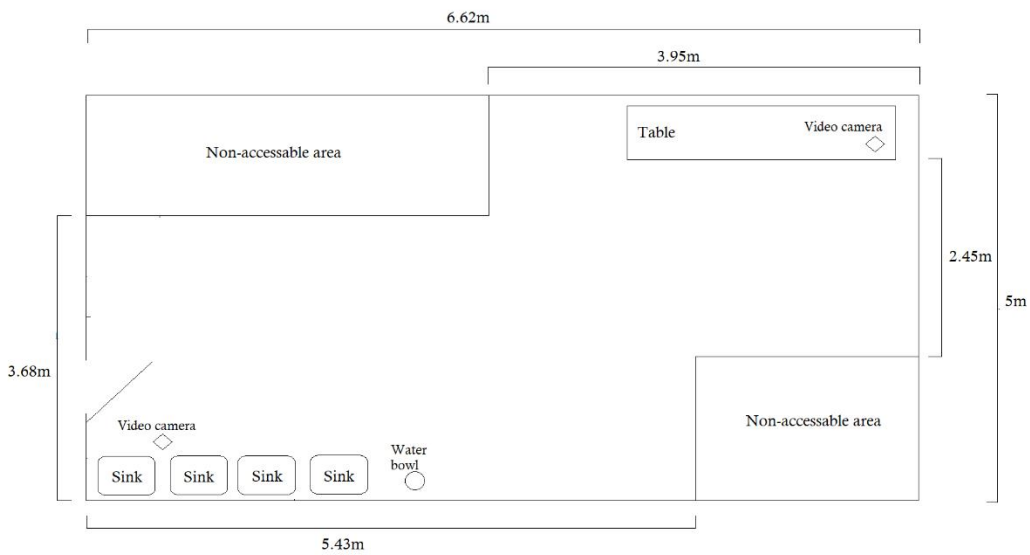


fig. 3. Measurement and fittings for room B. Half of the dogs were tested here during test 1 and the other half during test 2. The non-accessible areas were sealed off using compost fences. The owner was instructed to behave as it usually would in a similar situation. Therefore, the owner did not have to stand in a specific place in the room.

These rooms were selected with the idea that the dogs would experience the rooms for test 1 and test 2 as different ones, i.e., being in a new novel environment both times, but still not letting the rooms be so different that we could not control for external factors affecting the dogs' behaviours.

2.2.2. Behavioural analyses

The video recordings were analysed using the software The Observer XT (version 15). Behaviours of the dogs before, during, and after separation were observed, see table 2 for ethogram. Behaviours were recorded instantaneously (every 5 s), continuously, or as 1/0 sampling (every 5 s), see table 2. Data were summarised into three phases, consisting of *departure*, *separation*, and *reunion*.

The length of the departure period differed between the dyads, i.e., depending on how much time owners took before leaving the dog, hence, this was noted for each dyad. Mean values were calculated based on the total time in each phase. Also, the initiator of the first physical contact at reunion (owner or dog) was noted, as well as latency to first physical contact. However, these data were not further processed in this current study.

Table 2. Ethogram over observed behaviours, including definitions. The behaviours were selected based on measures used in previous studies of dogs and owners in separation- and reunion studies related to attachment.

Behaviour	Definition
<i>Instantaneous sampling (5s interval)</i>	
Lying alert	Dog is lying down but without its head in contact with the floor
Lying resting	Dog is lying down with its head in contact with the floor, including lying on its back receiving belly-rubs
Sitting	Dog is sitting with front legs extended and hind legs curved
Standing	Dog is standing up on all four paws or on its hind legs
Walking	Dog is walking around, moving
Running	Dog is running around, trotting or galloping
Proximity to door	Dog is <1 m from door
Proximity to owner	Dog is <1 m from the owner
Attention towards owner	Dog has its nose pointed towards the owner
Attention towards door	Dog has its nose pointed towards the door
<i>Continuous sampling</i>	
Lip-licking	Dog is snout licking, tongue visible
<i>One-zero sampling (5s interval)</i>	
Exploring	Motor activity directed towards any physical aspect of the environment

Grooming	Dog is cleaning its body surface by licking, nibbling, picking, rubbing, scratching etc.
Drinking	Dog is drinking water from the water bowl
Panting*	An increased frequency of inhalation and exhalation with mouth open
Tail-wagging	Repetitive wagging movement of the tail
Yawning	Dog opens its mouth widely and inhales
Vocalising	Dog is barking, growling, howling, or whining
Body stretching	Dog is extending/stretching a part of or whole body
Body shaking	Dog shakes any part of or whole body from side to side
Owner verbal contact	Owner talks to the dog
Owner physical contact	Owner pets/strokes/scratches/holds the dog
Dog physical contact	Dog leans, jumps up on and/or nudges/licking the owner

*This was later excluded due to inconsistency of outdoor temperature during test 2 contra test 1. The warm weather resulted in higher frequency of panting for almost all of the dogs during all the scenarios, which was not necessarily connected to the experience of the test itself.

The ethogram was created with the theory of attachment in mind. Vocalisation, proximity and/or attention towards door, are all behaviours connected to proximity seeking behaviours during a separation. Proximity and/or attention towards owner, physical contact, owner talking to dog, and tail-wag may be viewed during departure or reunion. During reunion, these behaviours may be followed by yawning, body stretching/shaking, grooming as a way to de-stress after a stressful situation (which a separation from the owner might be). Lastly, exploring the area during separation might be sign of unsecure avoidant attachment (i.e. the dog is not seeking proximity to the owner by e.g. looking at the door in his/her absence), whereas exploring during reunion may be viewed as a sign of a more secure attachment (indicating that the owner is providing a secure base).

2.3. Questionnaires

To measure the owner's adult attachment style, their caregiving style, the owner-dog relationship, and the dog's temperament, the owners were asked to answer different questionnaires (see below). These were distributed and answered through the online survey platform Netigate.

1. Experiences in Close Relationships Scale (ECR; Brennan et al., 1998)
2. Attachment Style Questionnaire (ASQ; Feeney et al., 1994)

These questionnaires were used for evaluating the owner's adult attachment style, as an indirect measure of their caregiving. The answers were graded using likert scales were if the participant disagreed with a statement, it would generate low scoring points (e.g., <3 points) and if he/she agreed with a statement it would generate higher scoring points (e.g., >4 points). When these points were added together and divided by the number of questions it resulted in scales indicating more or less avoidant or anxious adult attachment styles. The ECR contained 36 questions regarding fear of abandonment, ease of showing one's feelings, or sharing one's thoughts with a partner. The ASQ, on the other hand, included 42 questions about how the person experiences her own value, the value of other people, and the importance of friendship (i.e., less focused on intimate relationships compared to the ECR).

3. Monash Dog Owner Relationship Scale (MDORS; Dwyer et al., 2006)

This questionnaire was used for evaluating how the owner experienced the relationship with their dog. The owner answered questions regarding dog-human-interactions (i.e., how much time the dyads spend together on a daily basis), emotional closeness (as experienced by the owner), and how costly the owner considered the dog ownership. These three categories were used as subscales during analysis.

4. Canine Behavioural Assessment and Research Questionnaire (C-BARQ; Hsu and Serpell, 2001)

This questionnaire was used to evaluate the temperament of the dog. The questionnaire was divided into sub-scales and contained questions contributing to the following traits: excitability, aggression, fear and anxiety, separation anxiety, contact seeking, and trainability.

2.4. Statistical analyses

Statistical analyses regarding the behaviours shown were carried out using IBM SPSS statistics 27. To investigate potential differences in each dog's behaviour between the test situations, a non-parametric paired test, i.e., Wilcoxon's signed-rank test, was performed. We chose a non-parametric statistical method due to our small sample and the non-normal data. During analysis, behaviour during the three scenarios were summarised, i.e., the observed behaviours during departure, separation, or reunion for test 1 were tested against the observed behaviours during departure, separation, and reunion for test 2, respectively.

To further investigate the connection between the owners' AAS (ASQ and ECR), the dyads relationship score (MDORS), dog temperament (C-BARQ) and the behaviour of the dog in the separation and reunion test concerning attachment behaviour, Spearman rank correlation tests were performed.

3. Results

3.1. Behavioural observations during the separation and reunion test

There were no significant differences in any of the behaviours between the two tests, regarding any of the behaviours measured during all three scenarios: *departure* (fig. 4), *separation* (fig. 5), and *reunion* (fig. 6).

The owners varied in the time they took to depart, ranging from 11 seconds to 1 minute and 32 seconds (37 mean \pm 25 SD seconds). When asked how they were feeling during separation, all of them stated that they were not worried or anxious of leaving their dog alone in the unfamiliar room.

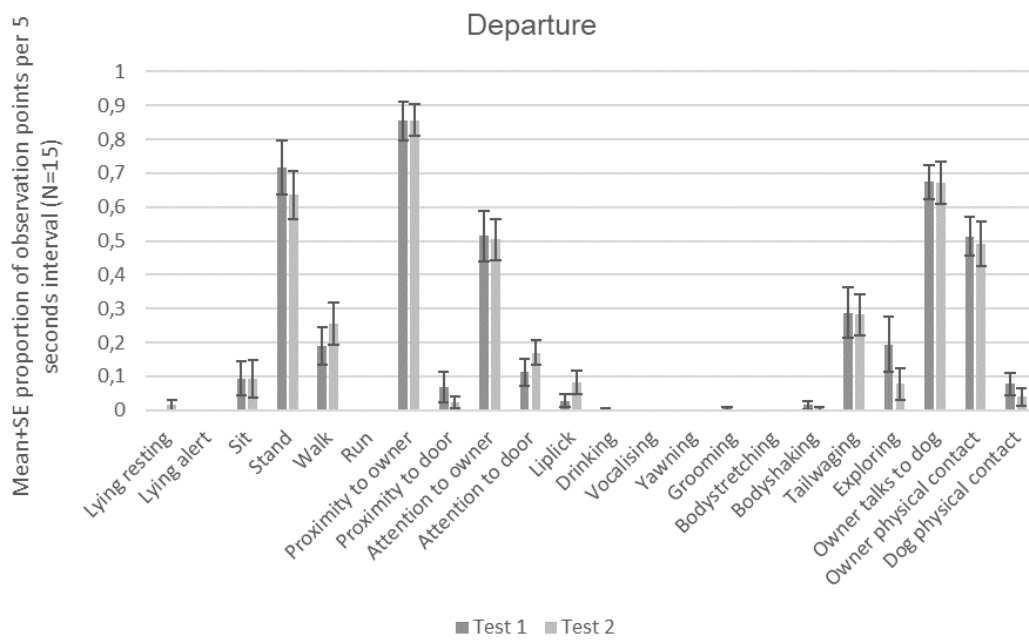


Fig. 4. A comparison between test 1 and 2 regarding the mean (+SE) number of observation points per 5 second interval during departure, i.e., the owner getting ready to leave the dog alone in the room. The length of this period differed between dyads (ranging from 11 seconds to 1 minute 32 seconds). There was no significant difference in the behavioral repertoire of the owners nor dogs between the tests.

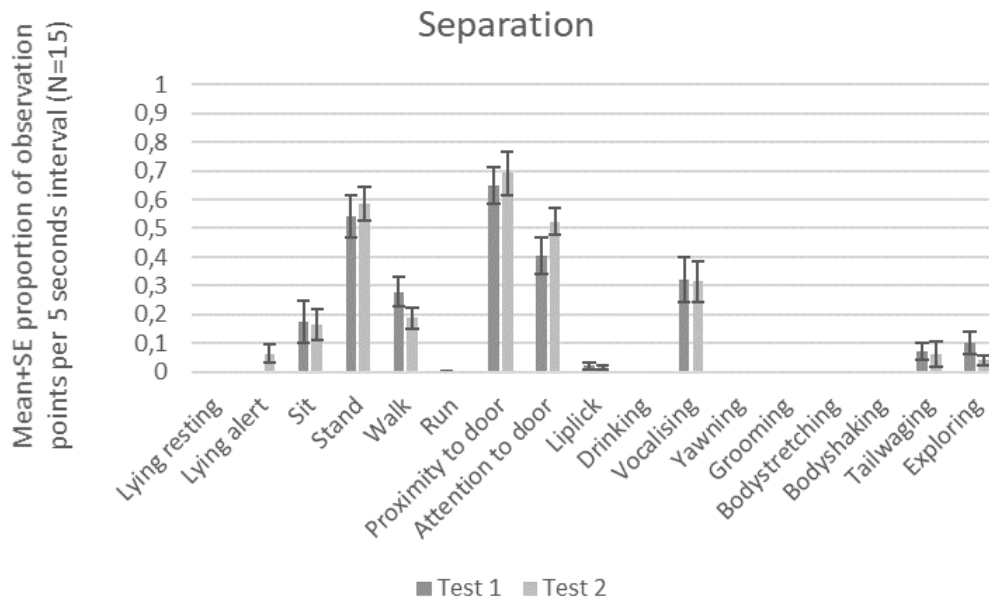


Fig. 5. A comparison between test 1 and 2 regarding the mean (+SE) number of observation points per 5 second interval during separation, i.e., the dog is alone in the room for 3 minutes. There was no significant difference in the behavioral repertoire of the dogs between the tests. Note that since the owners were absent during this scenario, scoring related to them was not possible, hence, creating absent bars.

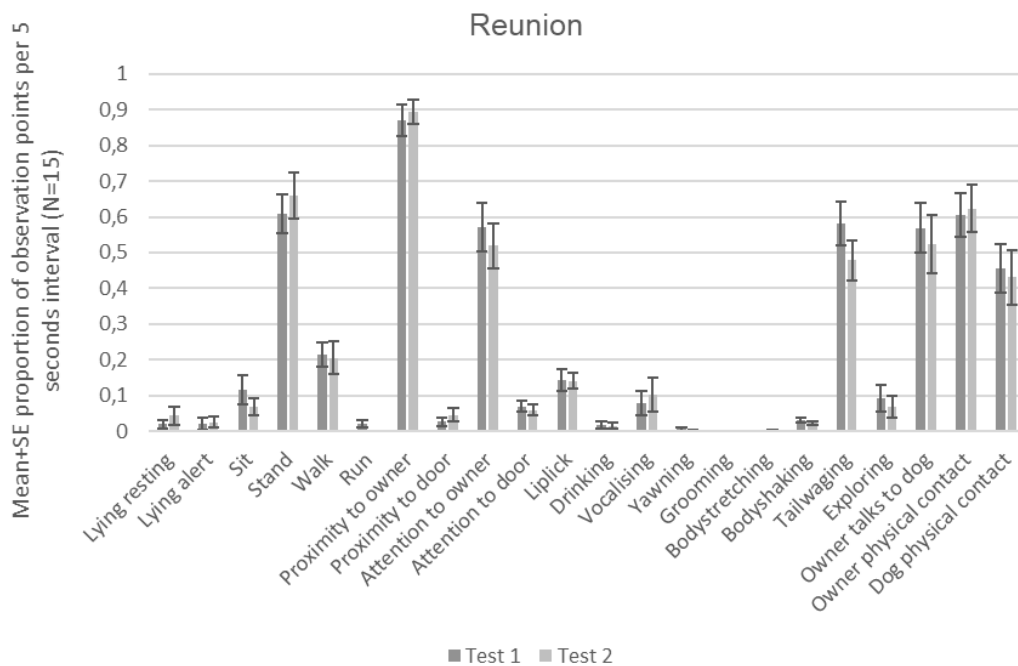


Fig. 6. A comparison between test 1 and 2 regarding the mean (+SE) number of observation points per 5 second interval during reunion, i.e., the owner has re-entered the room and the dyads are together again for 3 minutes. There was no significant difference in the behavioral repertoire of the owners nor dogs between the tests.

Since there was no difference in behaviour between test 1 and test 2, the following correlations were made using data from test 1 only.

3.2. Questionnaires

There was a positive correlation between the ECR and ASQ questionnaires regarding the anxious AAS ($r=0.749$, $p>0.001$, but not for the avoidant AAS ($r=-0.026$, $p=0.890$).

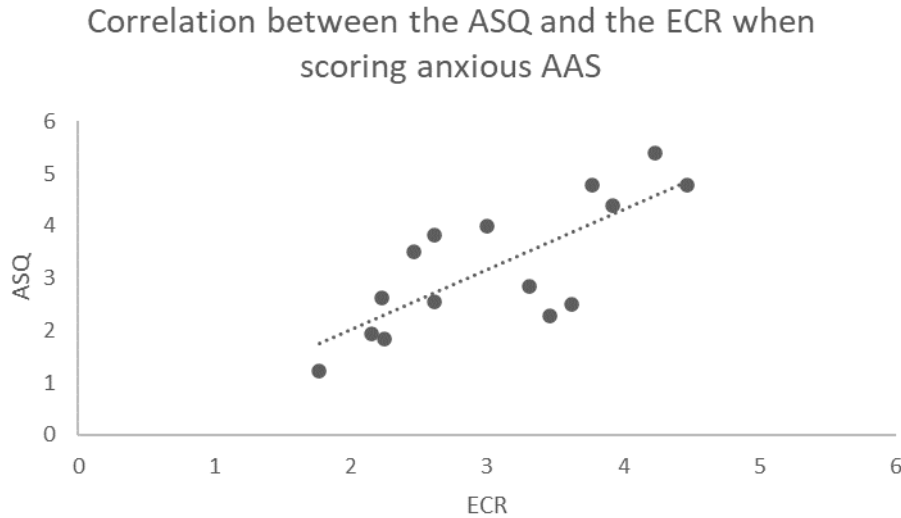


Figure 7. There was a positive correlation between the ASQ and the ECR when scoring anxious AAS ($r=0.749$, $p>0.001$).

3.2.1. Correlations between owner adult attachment style (ASQ and ECR) and everyday behaviour of the dog (C-BARQ).

Dogs described by their owners in the C-BARQ as expressing non-social fear (for example sudden noises or novel experiences), had owner with a more anxious AAS, both according to the ASQ ($r=0.387$, $p=0.042$) and the ECR ($r=0.516$, $p=0.005$). Dogs described in the C-BARQ as being more contact seeking had owners scoring low on the anxious scale, both according to the ASQ ($r=0.512$, $p=0.004$) and the ECR ($r=0.422$, $p=0.020$), whereas dogs described with more separation anxiety had more anxious owners (according to the ASQ but not the ECR, $r=0.406$, $p=0.026$).

Dogs who were scored high on aggression towards other dogs in the C-BARQ had owners with a more avoidant AAS according to the ECR ($r=0.408$, $p=0.025$) but not according to the ASQ ($r=-0.126$, $p=0.508$). Dogs expressing high excitability when for example going for a walk or going for a car trip, had owners with a more avoidant AAS (ECR, $r=0.508$, $p=0.004$). No such correlation was found with the ASQ avoidant scale. However, dogs showing owner-directed aggression was negatively correlated to more avoidant owners ($r=-0.401$, $p=0.028$). Being sensitive or fearful of touch corresponded to having an owner with a more avoidant AAS (ASQ, $r=0.390$, $p=0.040$).

There were no correlations found between MDORS and the other questionnaires in this study.

3.2.2. Correlations between questionnaires and behaviour during the separation- and reunion test

1.1.1.1. Departure

During the departure scenario, dogs paid more attention to owners with a more anxious AAS (ASQ, $r=0.426$, $p=0.019$), see figure 5. This was not shown in the ECR, but instead this questionnaire showed that dogs belonging to owners with a more anxious AAS, showed more proximity-seeking towards their owner (ECR, $r=0.434$, $p=0.017$), and less exploration (ECR, $r=-0.446$, $p=0.013$), see figure 6. Moreover, dogs of owners with a more avoidant AAS expressed less tail-wagging during departure (ECR, $r=-0.378$, $p=0.039$). Owners reporting a high level of emotional closeness had dogs who explored more in this phase (MDORS, $r=0.493$, $p=0.006$).

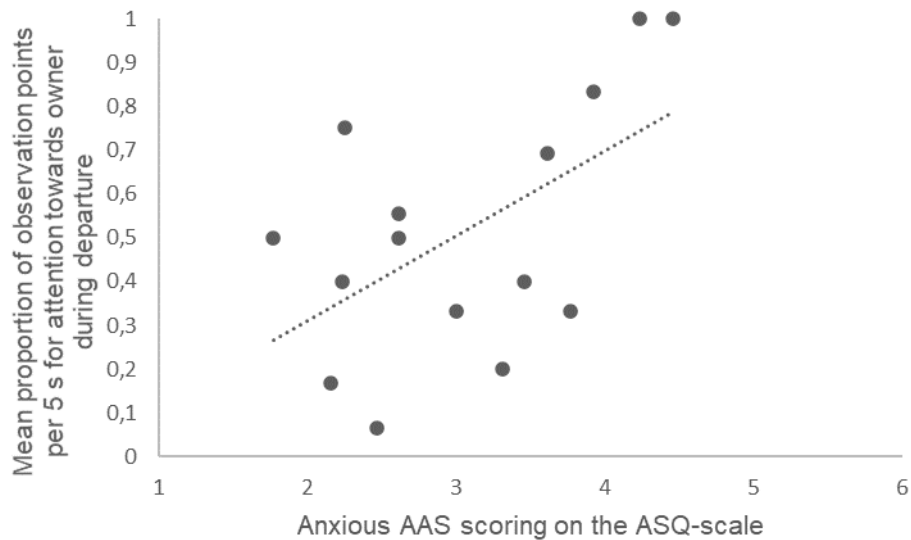


Fig. 8. Owners with a more anxious AAS (scored on the ASQ) had more attentive dogs during the departure phase ($r=0.426$, $p=0.019$).

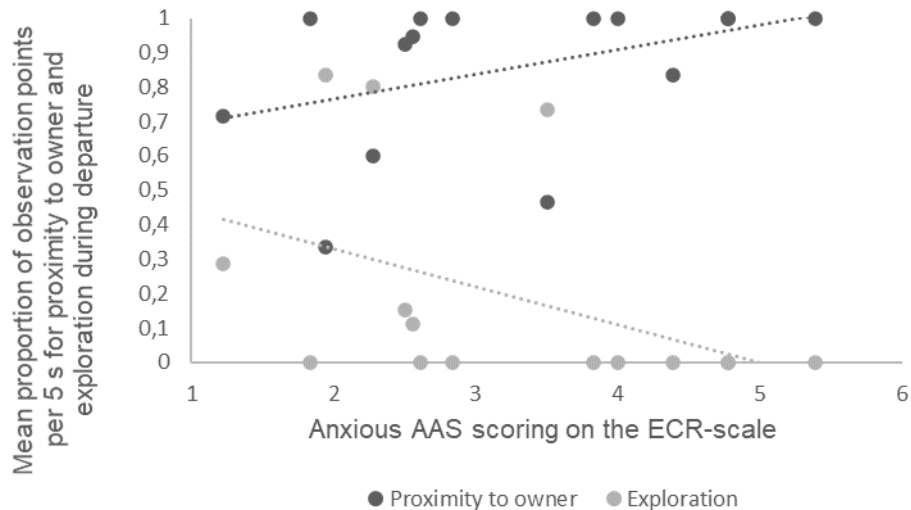


Fig. 9. Owners with a more anxious AAS (scored on the ECR) had dogs who kept more proximity to them during the departure scenario ($r=0.434$, $p=0.017$), but expressed less exploration ($r=-0.446$, $p=0.013$).

1.1.1.2. Separation

Dogs of owners with a more anxious AAS (ECR), vocalized more during separation ($r=0.459$, $p=0.011$). Exploratory behaviour was positively correlated to high scores on the dog-human-interaction scale (MDORS, $r=0.476$, $p=0.008$). The more attention seeking the dog was (according to C-BARQ) the more attention was paid towards the door ($r=0.361$, $p=0.050$).

1.1.1.3. Reunion

Dogs paid less attention to owners with a more avoidant AAS (ECR, $r=-0.474$, $p=0.008$) in the reunion phase and instead spent more time to explore the room ($r=0.520$, $p=0.003$). These owners did not talk much to their dogs during this phase ($r=-0.390$, $p=0.033$), nor did they initiate much, if any, physical contact ($r=-0.497$, $p=0.005$). Like in the departure- and separation phases, owners scoring high on the emotional closeness scale (MDORS) had dogs spending more time on exploratory behaviour during reunion ($r=0.555$, $p=0.001$).

4. Discussion

4.1. Main results

There were no significant differences in dog nor owner behaviour between the two tests, indicating that the everyday physical, emotional, or environmental changes did not have an impact on attachment behaviour when dyads were separated from and reunited with each other. Hence, the separation- and reunion test between dogs and owners is reliable.

When the owners were asked about how they were feeling during the separation, none of them expressed any kind of hardship. One stated that her dog suffered from separation anxiety, but despite this, she did not worry in this case, mostly due to the limited time the dog was left alone. Other participants had the same response, i.e., they believed that this short separation would not have a negative impact on their dogs. Some explained that they rarely worry about leaving the dog alone, regardless of the situation.

4.2. Correlations between questionnaires

We decided to use two different questionnaires related to AAS. Between these, there was a correlation regarding the measure (subscale) of anxious AAS, but not for the avoidant scale. This inconsistency is important to consider when interpreting the results. As an example, dogs who scored high on aggression towards other dogs in the C-BARQ had owners with a more avoidant AAS according to the ECR, but not according to the avoidant subscale in the ASQ. On the other hand, dogs expressing higher levels of non-social fear, for example to sudden noises or novel experiences, had owners with a more anxious AAS, both according to the ASQ and the ECR. Moreover, more attention seeking dogs had owners scoring low on the anxious scale, both according to the ASQ and the ECR. These findings are interesting, since both questionnaires are used when assessing human adult attachment (see e.g. Ghirardello et al., 2018; Brenning et al., 2011; and Parker et al., 2011 for studies using ECR, and Scrima, 2020; and López-de-le-nieta et al., 2021 for studies using the ASQ), and some researchers have used the ASQ when assessing attachment in owners and dogs (see e.g. Rehn et al., 2017; Fahlgren, 2019). Importantly though, we did not find any contradicting correlations between ASQ/ECR and the behaviour of dogs and owners in the behavioral test. The main problem lies on the avoidant scale, which is supported by the fact that there was no correlation on this scale between measures. However, further investigations about potential causes for these differences, and directions about which one to primarily use when studying dog attachment, is desirable.

Dog-aggressive dogs had owners who were more avoidant when measured with the ECR scale. This insecurity when meeting other dogs might be due to a lack of support from the owner (Konok et al., 2015), i.e., the owner fails to provide a safe haven and the dog therefore may feel a need to proactively defend itself from a potential threat (Rehn et al., 2017).

Being sensitive or fearful of touch corresponded to having an owner with a more avoidant AAS (according to the ASQ). If the owner does not initiate much physical contact, it is possible that the dog would respond with fear or avoidance when this happens. It might also be due to the owners being unable to properly read or rate fear in their dogs, creating uncertain fear-related results in the questionnaires. However, Flint et al. (2018) evaluated weather training regarding reading fear-expression in dogs affect how the owner would answer in the C-BARQ. They found that owners were accurate at assessing fear in their own dogs, but not when watching videos of unfamiliar dogs (Flint et al., 2018). It is therefore quite plausible that the participating owners in this study were able to properly interpret fear-expressions in their dogs. In contrast, dogs described by their owners as suffering from more separation anxiety had more anxious owners which, again, is in line with human research (see e.g., Mikulincer and

Shaver, 2007). However, Konok et al. (2015) found that separation anxiety was more prevalent in dogs owned by more avoidant owners. One explanation for this might be the fact that the owner's AAS not necessarily is connected to its CS regarding dog ownership, or that the different CSs need to be modified (i.e. further explored) when applied to dog ownership. In addition, Konok et al. (2015) used a different measure of AAS, the adult attachment scale, which may contribute to the discrepant results between this study and theirs. Herwijnen et al. (2018) used the term "parenting styles" in their study when comparing dog-human relationships to the child-parent. These styles are defined as *the authoritarian* (being demanding, high levels of control, low levels of responsiveness), *the authoritative* (demanding and responsive), *the permissive* (low levels of demandingness, strong responsiveness), and *the uninvolved* (low levels of both demandingness and responsiveness) (Baumrind et al., 2010). These styles seem quite similar to the CS/AAS presented here but may contribute to important components when applying the theory of child attachment to dogs. An evaluation of the AS/AAS/CS described in our study, when applied to dog attachment, is therefore desirable.

More contact seeking dogs had owners who scored low on the anxious scale (according to both ECR and ASQ). Scoring low on both the anxious and the avoidant scale may indicate a more secure AAS/CS of the owner (Feeney et al., 1994). Being more contact seeking towards a caregiver who is responsive to proximity seeking signals, is in line with previous attachment research (Topál et al., 1998; Siniscalchi et al., 2013). This is an indicator of the caregiver providing a safe haven after having experienced something challenging (in this case, the separation). In contrast, dogs expressing more non-social fear, e.g., towards sudden noises, had owners scoring high on the anxious scale (ECR/ASQ), which again is in line with previous human studies, stating that the AS of the attached individual may be a reflection of the AAS/CS of the caregiver (George and Solomon, 1996), i.e., more anxious owners may to a larger extent raise fearful dogs.

4.3. Correlations between owner characteristics, dog-human-interaction, dog temperament, and behaviour of dog and owner in the separation and reunion test

During the departure phase in the separation-and reunion test, owners scored as more anxious in the ASQ had dogs who paid more attention to them. This correlation was not found with the ECR, but here instead more anxious owners had dogs that kept close proximity to them and, consequently, did not explore. Together, this can either be explained by the dog expressing high levels of insecurity, and therefore clings to their owner in various ways – in this case looking at and/or staying close to the owner instead of exploring the novel environment, an occurrence previously found by Topál et al (1998). Children to insecure anxious caregivers have been shown to cling to them in similar ways in separation- and reunion tests when a period of separation is coming (Ainsworth et al., 1980). However, the level of interaction from the owner needs to be taken into consideration. Since the interaction initiated by the owner was low in this case, the response of the dog can be considered true in regards of expressing separation distress, one of the main pillars explaining attachment in children (Bowlby, 1958).

In the separation phase of the study, owners with a more anxious AAS (according to the ECR) had dogs that vocalized more when left alone, again in line with previous research, indicating higher levels of proximity seeking behaviour during separation (Siniscalchi et al., 2013). This is also in line with findings in human psychology, where children of parents with a more anxious attachment style often show great protest to separation (Ainsworth et al., 1980).

Owners scoring high on the dog-human-interaction scale in MDORS had dogs who explored more during separation. It is widely known that puppies should be presented to many different places to properly prepare them for the environment in which it is supposed to

function. Therefore, visiting different environment together with the owner may in some cases create a more secure dog with less neophobia, which in this case would indicate a secure base effect (Topál et al., 1998).

In the reunion phase of the separation and reunion test, dogs paid less attention to and initiated less physical contact with the owner if they belonged to more avoidant owners (according to the ECR). Importantly, these owners did not talk much to their dogs during the reunion phase and in return probably, their dogs expressed more exploratory behaviour. Hence, when the owner pays less attention towards their dog, he/she gets an equal response. This is again in line with how children to a more avoidant AS would behave in a reunion scenario with their parents, since avoidant caregivers are described as being limited in their interactions with the care recipient, both verbally and physically. The recipient may in turn deactivate its attachment system, creating an avoidant AS (Ainsworth et al., 1980). However, expressing exploratory behaviour in the reunion phase might also be due to a feeling of security now that the owner has returned, hence, the owner is succeeding at providing a secure base despite having a more avoidant AAS/CS. This further points to difficulties when using the avoidant scale for studies of attachment in dogs.

Owners who considered themselves as being emotionally close with their dog (according to the MDORS), had dogs who explored the area more during all phases of the test. Partly, this complies with other researchers' findings, suggesting that being emotionally close with or involved in your companion pet makes you a secure base from whom it can investigate, and hopefully even a safe haven to return to when facing a potential threat (Topál et al., 1998). The results may seem contradictory, since exploratory behavior were seen in all phases of the test – even separation which is argued to indicate that the owner may be more avoidant in its caregiving towards the dog. Note that being emotionally close is not explained in terms of attachment. Owners may report having a close emotional bond to their dogs but may report themselves as being more avoidant in their relationship to other people. They may also behave in an avoidant way towards their dogs although they feel emotionally close, or use the dog as a substitute for getting close to other people. Rehn et al. (2014b) found that the dog's attachment behaviour in the SSP were not affected by emotional closeness, but by the level of daily interactions.

4.4. Strengths and weaknesses of the study

In this study, we included other attachment figures than the actual owners. We argue that this contributes to a valid diversity of the sample, since dogs can form several attachment bonds (Gácsi et al., 2001). The attachment may not be equally strong to secondary attachment figures as compared to primary ones. However, since the main aim of this study was to study if the dyads behave the same during two identical separation- and reunion tests, the behaviours shown would not influence the results namely. When further investigating the validity, it might have a bigger impact and should be taken into consideration.

Using privately owned dogs has its scientific limitations since genetics, background and upbringing is not controlled for, as when using laboratory study subjects – which has also been done previously when studying attachment in dogs (see e.g., Habbe, 2016; Fahlgren, 2019). Nonetheless, the positive aspects of this are that the validation of the test becomes directly applicable to reality since most dogs in fact are privately owned. In addition, laboratory subjects may not have a clear attachment figure, while privately owned dogs do. Also, when studying attachment, differences in previous history are explaining factors rather than confounding. Moreover, since each dog-owner dyad was compared to itself (they worked as their own controls) and no comparison between dyads took place, the effect of individual differences was controlled for in the design.

It would seem that the dogs remembered the scenery and showed more or less signs of stress during the tests. This could be explained by the fact that they believed they were in the same environment as the last time. A solution for limiting the risk of the similarities of the rooms affecting the results, can be for future researchers to modify the rooms, changing places of the fittings and non-accessible areas to make them more sensory different to the four-legged participants, but still being controlled experimental settings. However, these differences were not significant. The small changes in behaviour were within the margin of error and we can therefore conclude that there was no difference in behaviour when separated from the owner in a novel environment. Furthermore, since there was no difference in behaviour between the tests, the time interval (28 days i.e., a month) can be considered enough.

The small number of participants created a limitation in the correlation part of this study and the results should therefore be very cautiously interpreted and further research is needed in order to increase our understanding. However, for investigating the main issue in this study, i.e. comparison between two identical tests, we argue that the number of participants is satisfactory.

The questionnaires used to evaluate AAS are developed to study relationships between humans, and they are not modified nor validated for their use to study dog-human relationships. In the future, these measures should undergo such an investigation, or the parenting styles used by Herwijnen et al. (2018) seems a promising measure of AAS/CS in dog owners.

4.5. Conclusion

Behaviours of dog and owner are consistent over time when it comes to separation and reunion in a novel environment. This method is therefore considered reliable for further use in the study of attachment between dog and owner. The results from the correlations between the tests and the questionnaires can be viewed as a beginning to validate the study but should be done using a larger sample. We can therefore only speculate, but the results may indicate that dogs to more anxious owners may be more sensitive to external challenges that many dogs are exposed to on a daily basis, such as meeting unfamiliar people and dogs, being in novel environments, being left alone, etc. Dogs to more avoidant owners may have different strategies to handle stressors as compared to dogs to more anxious owners, meaning that there is a risk of these dogs are stressed although showing it in another, less obvious, way. The ECR and the ASQ questionnaires should be further evaluated, including more participants, to distinguish which one is more accurate to use when converting ones AAS to CS, at least when assessing dog and owner relationship in terms of attachment.

This study did not include any use of materials and therefore there was no issue regarding sustainability, except for transportation to and from the test site for the participants.

Investigating attachment between dog and owner may have a great impact on dog welfare, since gaining knowledge about how owner behaviour can influence dog behaviour may create a positive shift in their interaction routine and their relationship quality. This is useful in the attempt of reaching the third of the United Nations sustainable development goals concerning “*Good health and well-being: Ensure healthy lives and promote well-being for all at all ages*”. More studies in different areas of the subject are therefore highly longed for.

5. References

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