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Comparison of the attachment behaviour of dogs to their owners in Austria and Hungary.

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## **Abstract**

The Attachment theory, developed by John Bowlby, states that there is an invisible bond between two individuals, the attachment figure and the attached individual, which leads to proximity-seeking behaviour to the attachment figure and a distress reaction during separation from the attachment figure in the attached individual. Bowlby argued that the biological function of attachment was to ensure the survival of offspring. The original work was based on studies on human infants concerning the mother-infant relationship. Dogs are able to show such attachment with their owners, which is likely based on a genetic predisposition to form close social bonds with humans shaped during domestication. With minor modifications, dogs can also be tested with the same paradigm for attachment (Strange Situation Test) as human children. In both species, attachment can be influenced by different factors. For instance, the way dogs are kept affects their behaviour in unfamiliar situations, as dogs held in a “companion relationship” follow the owner more frequently and glance more at the owner than dogs held in a “working relationship.” Furthermore, the personality of the owner can have an impact on the dog’s behaviour and there is a positive correlation between the owner’s warmth and the proximity-seeking behaviour in a threatening situation. Interestingly, there are cultural influences on the attachment bond, possibly because in some countries dogs live more often indoors, whereas in other countries they live more often outdoors. The aim of this study was to investigate possible cultural differences in the attachment between owners and dogs in Austria and Hungary, especially in Vienna and Budapest and their suburban areas. Although the cities are in close distance and quite similar to each other, previous studies have indicated that owners may differ in how they keep their dogs. Seventy-seven dog-owner pairs from Austria and seventy-seven from Hungary participated in this study. A questionnaire about the dog-owner attachment was used to determine the attachment of the owner and their evaluation of the attachment of their dog. The Strange Situation Test from Ainsworth (SST) was used to explore the attachment behaviour of the dogs in a testing situation. The results showed that Hungarian owners were more anthropomorphic and rated their dogs as more attached. Furthermore, the Hungarian dogs showed more attachment in the SST. Additionally, the questionnaire data was correlated with the data from the SST. When the data of the two countries was not separated, there was a correlation between the attachment of the owner and the proximity to the owner and the greeting intensity. When the data were separated, the attachment of the owner was significantly correlated with the proximity to the owner in Austria, but all other correlations were not significant, including all correlations in the Hungarian sample. This study shows that there is a cultural difference in the attachment bond between a dog and its owner, even in two European cities that are quite similar in structure. The reason why such a difference in the attachment bond exists in two similar cities remains unclear and should be the subject of future studies.

## Zusammenfassung

Die Bindungstheorie basiert auf John Bowlbys Theorie, dass zwischen zwei Individuen, der Bindungsperson und dem an sie gebundenen Individuum, eine unsichtbare Bindung besteht. Diese Bindung führt bei dem an die Bindungsperson gebundenen Individuum zu Nähe suchendem Verhalten in ihrer Anwesenheit und zu einer Stressreaktion bei Trennung von ihr. Bowlby argumentierte, dass die biologische Funktion von Bindung, das Sicherstellen des Überlebens des Nachwuchses ist. Die Bindungstheorie basierte ursprünglich auf Studien an menschlichen Säuglingen zur Mutter-Kind-Beziehung. Auch Hunde sind in der Lage, eine solche Bindung zu ihren Besitzern aufzubauen, was wahrscheinlich auf eine genetische Veranlagung zur Bildung enger sozialer Bindungen mit Menschen zurückzuführen ist, die während der Domestikation entstanden ist. Mit kleinen Abänderungen können Hunde mit der gleichen Art von Test für Bindung (Strange Situation Test) getestet werden wie menschliche Kinder. Sowohl bei Menschen als auch bei Hunden kann die Bindung durch unterschiedliche Faktoren beeinflusst werden. Die Art der Haltung von Hunden kann ihr Verhalten in ungewohnten Situationen oder bei Problemlösungsaufgaben beeinflussen, da Hunde in einer „Begleitbeziehung“ ihrem Besitzer/ihrer Besitzerin häufiger folgten und ihn/sie häufiger ansahen als Hunde in einer „Arbeitsbeziehung“. Darüber hinaus kann die Persönlichkeit des Besitzers/der Besitzerin das Verhalten des Hundes beeinflussen. Es besteht eine positive Korrelation zwischen dem Persönlichkeitsmerkmal ‚Wärme‘ des Besitzers/der Besitzerin und dem Nähe suchenden Verhalten des Hundes in einer bedrohlichen Situation. Interessanterweise gibt es kulturelle Einflüsse auf die Bindung, möglicherweise weil Hunde in manchen Ländern häufiger im Haus leben, während sie in anderen Ländern häufiger im Freien sind. Ziel dieser Studie war es, mögliche kulturelle Unterschiede in der Bindung zwischen Besitzer und Hund in Österreich und Ungarn zu untersuchen, insbesondere in Wien und Budapest und ihren Vororten. Obwohl die zwei Städte nicht weit voneinander entfernt sind und sich recht ähnlich sind in Struktur, Größe und Einwohnerzahl, konnten Studien bereits einen Unterschied in den Haltungsformen finden. An dieser Studie nahmen 77 Hund-Mensch-Teams aus Österreich und 77 aus Ungarn teil. Ein Fragebogen zur Bindung zwischen Hund und Besitzer/Besitzerin wurde verwendet, um die Bindung des Besitzers/der Besitzerin und seine/ihre Einschätzung der Bindung seines/ihrer Hundes zu ermitteln. Der Strange Situation Test von Ainsworth (SST) wurde verwendet, um das Bindungsverhalten der Hunde in einer Testsituation zu untersuchen. Die Ergebnisse zeigten, dass ungarische Besitzer/Besitzerinnen anthropomorpher waren und ihre Hunde als stärker gebunden einstufen. Darüber hinaus zeigten die ungarischen Hunde im SST mehr Bindungsverhalten. Zusätzlich wurden die Fragebogendaten mit den Daten aus dem SST korreliert. Wenn die Daten der beiden Länder nicht getrennt wurden, gab es eine Korrelation zwischen der Bindung des Besitzers/der Besitzerin und der Nähe zum Besitzer/zur Besitzerin und der Begrüßungsintensität. Wenn die Daten getrennt wurden, korrelierte die Bindung des Besitzers/der Besitzerin signifikant mit der Nähe zum Besitzer/zur Besitzerin in Österreich, allerdings waren alle anderen Korrelationen nicht signifikant, einschließlich aller Korrelationen in der ungarischen Stichprobe. Diese Studie zeigt, dass es einen kulturellen Unterschied in der Bindung zwischen einem Hund und seinem Besitzer/seiner Besitzerin gibt, sogar in zwei europäischen Städten, die in ihrer Struktur recht ähnlich sind. Der Grund, warum ein solcher Unterschied in zwei ähnlichen Städten besteht, bleibt unklar und sollte Gegenstand künftiger Studien sein.

## Introduction

### *Social life, social bonds and attachment*

Animals living in a social group form social bonds (Hinde, 1976) which have a variety of characteristics and functions, one of it is attachment. Attachment describes an unique, asymmetrical bond between two individuals (Ainsworth, 1967, as cited in Cassidy, 2008; Bowlby, 1958; Wickler, 1976). The framework of attachment is very influential in understanding emotional and affectional bonds in social species (Ainsworth et al., 1978; Cassidy, 2008). Infants develop a psychological attachment towards their primary caregiver, which are mostly the parents, especially the mother (Ainsworth, 1989; Ainsworth et al., 1978; Cassidy, 2008). While it is well known, what an attachment bond is, it is not completely clarified how an attachment bond develops. There is a huge variety in theories concerning this process, rooting from different areas of biology such as e.g. the “learning theory” or the “ethological theory”. One of the first theories concerning the learning of social bonds comes from Konrad Lorenz (1937) and his paper on the imprinting process in young precocial birds, where he described the forming of social bonds in precocial birds in a sensitive period in early socialization. Rajecki et al. (1978) reviewed that Scott (1971) stated that the basic mechanism in the development of social attachment was the emotional stress while the absence of the familiar social object. Scott (1971) said that the attachment bond got stronger the more often an individual was separated from the familiar object. However, this theory was somehow falsified by other studies, including young monkeys or dogs (Hinde & McGinnis, 1977; Rajecki et al., 1978b). A more recent theory which explicitly concerns attachment is the ethological theory of John Bowlby (1969) and Mary Ainsworth (Ainsworth, 1969; Ainsworth et al., 1978; Rajecki et al., 1978), which were both developmental psychologists, developed in the 1960s and 1970s. Bowlby proposed that the behavioural patterns which human infants show to seek and maintain proximity to their caregiver, represent patterns developed in earlier history of man to stay in contact with their caregiver (Ainsworth, 1969; Ainsworth et al., 1978; Bowlby, 1958; Rajecki et al., 1978). Because these behaviours lead the child to be close to its parents and therefore support the safety of the infantile child, it has been selected in the course of genetic evolution (Bretherton, 1992; Rajecki et al., 1978).

Research on social bonds in non-human animals reveals that attachment processes are not unique to humans but are deeply rooted in evolutionary biology (Ainsworth & Bell, 1970; Elliot & Scott, 1961; Mason & Berkson, 1975; Rajecki et al., 1978; Stettner & Tilds, 1966; Topál et al., 1998). There were different studies, which investigated social bonds at four phylogenetic levels: in precocial birds, dogs, monkeys and human infants. For example, in a study of Stettner and Tilds (1966) it was shown that in an open field test ducklings refused to be near a fear-provoking stimulus when the object of attachment was not present, whereas when the attachment object was placed between the threatening stimulus and the duckling, the duckling approached the attachment object, even though this meant also approaching the threatening object. Another example is the study of Mason and Berkson (1975). They did behavioural tests with monkeys where the individuals showed more distress behaviour in an unfamiliar cage when tested alone than with the surrogate together. They provided evidence that environmental changes can have different emotional responses depending on if an attachment figure is

present or not. Bowlby and Ainsworth's attachment theory mainly concentrates on the characteristics of an attachment bond and how it influences the infants' behaviours in different situation e.g. during separation or when a threatening stimulus occurs (Ainsworth et al., 1978; Bretherton, 1992; Cassidy, 2008). Bowlby was interested in finding the adaptive value of attachment and other behavioural systems which are related to attachment (Bretherton, 1992). In this study, I want to investigate the social bond between dogs and humans in the context of Bowlby and Ainsworth's attachment theory, while also examining how this concept may vary across different countries and cultures.

### *Attachment theory*

Bowlby (1969) (Ainsworth et al., 1978) originally argued that through evolution humans developed a genetic predisposition which favoured the proximity seeking behaviours of an infant to its mother and which led to an increased likelihood of protection and provided a survival advantage (Bretherton, 1992; Rajecki et al., 1978). Bowlby therefore argued that the protection from predators and hence the survival of the species is the biological function of attachment (Cassidy, 2008). Attachment is a system to regulate safety of the infantile child with a relatively long period of vulnerability, which means that the infant is genetically predisposed that in times of stress and threat it searches for close contact with the attachment figure (Ainsworth et al., 1978; Cassidy, 2008). In the framework of attachment - usually the primary caregiver - which mostly is the mother, serves as the attachment figure for the infant. An attachment figure is an individual to which one individual is attached (Ainsworth et al., 1978; Cassidy, 2008). In this context it is important to distinguish between affectional bonds and an attachment bond. Affectional bonds are bonds which endure over time, the person to which the bond exists is not interchangeable with any other person, the relationship has to be emotional significant, the individual wants to be in more or less close contact to the other person and the individual feels distress while an unwilling separation (Ainsworth, 1989). For an attachment bond there is another criterion which has to be fulfilled. This criterion is that the individual searches for security at the attachment figure in stressing or threatening situations (Ainsworth, 1989). Therefore, the attachment bond includes the attachment behaviours, which are behaviours to promote and maintain proximity to the object of attachment e.g. staying in proximity to the attachment figure, following or approaching (Ainsworth & Bell, 1970; Wickler, 1976). Furthermore, it presumes that there is a response after separation from the attachment figure, the so-called separation distress (Cassidy, 2008). The third component is the safe haven effect. This effect describes an individual's search for safety with their attachment figure after experiencing a threatening stimulus (Ainsworth, 1989). The fourth component is the secure base effect. The secure base effect describes the phenomena that the attached individual feels safe enough to engage in not proximity restoring behaviours like exploring the environment or playing after the reunion with the attachment figure (Ainsworth, 1989; Ainsworth & Bell, 1970; Cassidy, 2008). The attachment system appears to serve a biological function of protection. Once an attachment bond is formed it does not disappear in periods where the attachment behaviour is not present or used (Ainsworth et al., 1978; Ainsworth & Bell, 1970). This relationship obtains a dependency from one individual to the other and can be seen, among other things, through behavioural preferences (Wickler, 1976). It might seem a bit contradictory that attachment behaviours aim to maintain proximity while also supporting exploratory

behaviour. However, it is essential to understand that the attachment bond provides a sense of security strong enough to allow the child to explore their environment confidently. In this safe and supportive context of attachment, the child should feel secure enough to inspect the world around it (Ainsworth, 1989; Cassidy, 2008). However, in this study I will focus on the attachment behaviours.

Mary Ainsworth, an American Canadian scientist, developed a method to investigate the attachment bond between a human infant and his mother. This method is called the Strange Situation Test (Ainsworth, 1969; Ainsworth & Bell, 1970; Bretherton, 1992). In this test the caregiver and infant are introduced in an unfamiliar room. After getting confronted with a stranger, there are three episodes of separation and two episodes of reunion with the caregiver (Ainsworth et al., 1978; Ainsworth & Bell, 1970). Behaviours that get coded in this test are e.g. the proximity to the owner or the stranger, the following behaviour, the proximity to the door while separation from the caregiver or the behaviour while and after reunion with the caregiver. Nowadays, it is a widely accepted and appreciated method to test attachment in human infants. Based on her studies in the Strange Situation Test, Ainsworth identified three attachment styles. Later a fourth category was added. The categories are secure attachment, insecure-avoidant attachment, insecure-ambivalent attachment and disorganized attachment (Ainsworth et al., 1978; Main & Solomon, 1990, as cited in Reijman et al., 2018). In a secure attachment bond the infant is securely attached to its mother which means that the child is in distress while separation from the attachment figure and actively searches for proximity upon reunion and tries to maintain the contact to the attachment figure, but after a certain period of time the infant is able to explore the environment again or it returns to play. These infants use their attachment figure as a secure base (Ainsworth et al., 1978; Spangler & Grossmann, 1993). The second category is the insecure-avoidant attachment group. The children in this group show less or not any distress signals while separation and ignore the mother while reunion (Ainsworth et al., 1978; Spangler & Grossmann, 1993). The third group, the insecure-ambivalent group, shows heavy distress signals while separation and ambivalent reaction while reunion. They search for contact but also try to avoid proximity to the attachment figure. They cannot be easily calmed down by their attachment figure (Ainsworth & Wittig, 1969 as cited in Ainsworth et al., 1978; Cassidy, 2008). The infants from the fourth group, the disorganized attachment, do not fit in any of the other groups and show contradictory and confusing behaviours (Main & Solomon, 1990, as cited in Reijman et al., 2018; Spangler & Grossmann, 1993). In the study of Spangler and Grossmann (1993) they investigated the behaviour of infants during separation from the mother in a Strange Situation test. They also measured the heart rate and cortisol levels. Infants of all attachment types showed an increase in the heart rate while separation with disorganized infants having the highest increase. Insecurely attached individuals showed higher cortisol values than securely attached ones, which could be a sign of an ineffective coping strategy.

Which attachment bond the infant or an individual in general develops depends strongly on the behaviour of the mother or the attachment figure (Ainsworth et al., 1971, 1978). When the attachment figure reacts sensitively and adequately to the emotions and needs of the infant, there is a high probability that a secure attachment develops (Ainsworth et al., 1971, 1978). In contrast, caregivers who maintain emotional distance often contribute to insecure-avoidant attachment patterns, while

inconsistent caregiving is commonly associated with insecure-ambivalent attachment (Ainsworth et al., 1971; Cassidy & Berlin, 1994; Grossmann & Grossmann, 2006). Furthermore, the attachment bond can be influenced by cultural differences in e.g. child-rearing styles. In general, the secure attachment bond seems to be the most prevalent category in many countries (Van IJzendoorn & Kroonenberg, 1988). Rothbaum et al. (2000) highlighted that in the USA it is important to foster the independence and autonomy of the infant, whereas in Japan close physical and emotional contact is more emphasized, what also supports dependency on caregivers. This leads to a more dominant insecure-avoidant pattern in the USA and a more dominant insecure-ambivalent pattern in Japan. In the study of Van IJzendoorn and Kroonenberg (1988) they also showed more insecure-ambivalent attachment bonds in Japan than in North Germany, where the insecure-avoidant group is more prevalent compared to Japan. Supporting independence and autonomy in the child seems to shift the attachment bond to the insecure-avoidant group, because the parent does not react very sensitive and accurate to the distress signals of their infant, which had been shown in the study of Grossmann et al. (1985). In Italy a lower percentage of secure attached infants has been observed, potentially due to mothers of very young infants working longer and therefore using professional childcare (Simonelli et al., 2014). Korean attachment patterns are similar to those seen in Japan with a special focus on close emotional and physical contact to the caregiver. This leads to a higher prevalence of insecure-ambivalent bonds, nevertheless the percentage of secure bonds is similar to the global distribution (Jin et al., 2012). In the study of Jin et al. (2012) they did a Strange Situation Test where mothers stayed in proximity of their infants, even when the infants were not stressed anymore. Furthermore, the children did not actively search for contact with the mother because they relied on their mothers to initiate immediate contact.

#### *Attachment theory applied to dogs*

In recent years, attachment theory has been also applied to non-human animals, notably dogs. Indeed, the relationship between humans and dogs is outstanding in comparison to the relationship with other animals in most societies. Moreover, the dog-human relationship resembles a very special case: on one hand, it is a bond between two distinct species; on the other hand, it somehow resembles the bond between a mother and her infant (Prato-Previde et al., 2003; Topál et al., 1998). Dogs were domesticated around 10 000 - 15 000 years ago (Thalmann et al., 2013). It is remarkable that dogs developed close contact with humans around 3000 to 5000 years earlier than any other species (Morey, 2006). Through evolutionary processes dogs left the niche of their ancestors, the wolves, and became part of the human niche, which now is the natural habitat of dogs (Miklósi et al., 2004). This process of domestication resulted in both morphological changes like shorter snouts, different colours or changes of the tail and to behavioural adaptations and communicative abilities; hence, dogs developed a dependency on humans and accept them as a companion (Belyaev, 1979). Through domestication dogs developed a genetic predisposition to form close social bonds and attachment relationships with humans (Miklósi et al., 2003, 2004; Topál et al., 2005).

This unique relationship has been studied using various methods, including an adaptation of the Strange Situation Test, which was originally developed to analyse mother-child attachment. It triggers behaviours

while separation and reunion which can be seen in the mother-infant relationship too (Topál et al., 1998). The SST is a new situation for the dog-owner pairs. It consists of different episodes where the dog is in a testing-room together with its owner, with a stranger or alone to analyse the behaviour while separation, reunion and togetherness. Dogs, like human children, show behaviours associated with attachment like following their owner, maintaining proximity and showing stress signals while separation (Topál et al., 1998). This implies that there are functional similarities because of evolutionary convergence in how infants and dogs form attachments (Gácsi et al., 2001; Millot, 1994; Topál et al., 1998). Topál et al. (1998) examined the attachment behaviour of dogs in a Strange-Situation test. They demonstrated that dogs tend to behave similarly to children in this testing situation. The dogs stood significantly longer at the door when the owner was absent than when the owner was present in the room, not even the presence of the stranger had a calming effect on the dog, which highlights the strong preference for the owner in the stressful situation. In addition, the dog showed lower levels of contact seeking with the stranger compared to the owner. However, Prato-Previde et al. (2003) concluded that the relationship between a dog and its owner is surely a strong affectional bond but does not fulfil all criteria needed to call it an attachment bond. To test, if the relationship of dog and owner is an attachment bond, Palmer and Custance (2008) did an improved Strange-Situation test and determined that the relationship indeed fits into the system of attachment.

Based on earlier findings, different studies concerning the dog-human attachment dogs exist, investigating the bond under different aspects. Horn et al. (2013) investigated the secure base effect in the dog-owner relationship within a problem-solving task. The dog-owner pairs were tested in a manipulative task under three different conditions in two separate experiments. The dogs from experiment 1 were from Hungary and the dogs from experiment 2 were from Austria. The first condition was that the owner was absent during the task, the second that the owner was present but remained silent and the third condition was that the owner was present and could verbally encourage the dog. A second person, the experimenter, was always present. The second experiment were under the same three conditions, but one conditions was added, where the owner was replaced by an unfamiliar human, which remained silent. In experiment 1 the dogs manipulated the apparatus significantly longer when the owner was present, than when he was absent, but there was no difference when the owner was silent or did verbally communicate with the dog. Before the manipulative task the dogs were tested also in a Strange Situation Test. No correlation could be found between the dogs' distress levels in the SST and the problem-solving task. The time the dogs spent close to the owner did not differ between the two conditions in which the owner was present, but the dog was significantly more in proximity of the experimenter when the owner was absent than when he was present. The results of experiment 2 were similar to those in experiment 1. The dogs manipulated the apparatus shorter when the owner was absent and when the owner was replaced by an unfamiliar human than when the owners was present and encouraging. There was also no difference in manipulating in both conditions where the owner was present (owner silent vs. encouraging) and, in those conditions, where the owner was absent (owner absent vs. replaced). The dogs spent more time in proximity of the experimenter when the owner was absent than when the owner was present, which was similar to experiment 1. Experiment 2 therefore

could replicate the results of experiment 1. The added condition “Replaced Owner” in experiment 2 showed a clear preference for the owner as a secure base in a problem-solving task, because just the presence of an unfamiliar human did not increase the duration of the manipulation (Horn et al., 2013). This specific reaction towards the owners presence is another evidence that the dog-owner attachment bond is comparable to those in mother-infant relationships and that the secure base effect exists in the dog-owner relationship too (Ainsworth, 1989; Mariti et al., 2013).

In addition to the secure base, the owner's ability to serve as a safe haven for the dog in stressful situations also plays a crucial role, as the study by Gácsi et al. (2013) showed. In their experiment, they investigated the effect of a threatening stimulus on the dogs' behaviour. Additionally, they measured heart rate and heart rate variability (HRV) – which describes the variation in the time interval between heartbeats - providing more objective variables for the study. The physiological responses to separation had already been analysed in human studies too (Spangler & Grossmann, 1993). The experimental procedure of Gácsi et al. (2013) was that the dog got confronted with a stranger in an unfamiliar room, one time with the owner present and one time with the owner absent. There was a significant difference in case that the heart rate increased more pronounced when the dog was confronted with the stranger while being alone than being with the owner, what can be interpreted that the owner helped the dog in coping with stress. While separation from the owner, the HRV increased which could mean that the dogs were focused on the return of the owner. When confronted with the threatening stranger the dogs showed a decrease in HRV which characterized distress in this situation. However, with the owner present the HRV showed not such a big variation. These results demonstrated that the owners could have a calming effect on the dog in threatening situations, providing evidence that the owners served as a safe haven (Gácsi et al., 2013).

The first study which adapted the Bowlby-Ainsworth-Main and Solomon attachment classification system for dogs was the study by Schöberl et al. (2016). The aim of the study was to look at the influence of social factors like attachment or personality on the cortisol reactivity of dogs in an attachment assessment. The owners had to fill out questionnaires about the owner's and dog's personality, the adult attachment representation toward humans and their dog, as well as general information about their everyday lives. Furthermore, the dog-owner dyads participated in three test sessions, but only session two and session three were relevant for that study. Session two consisted of one “play session” and one session where the dog was confronted with a “mild threat,” once with the owner present and once without. In the third session, an Ainsworth Strange Situation Test adapted for dogs was conducted. The classification of the dogs into the four attachment groups was done by experts. To measure cortisol, saliva samples were taken 15 minutes before and after the first and second session, and 15 minutes before, immediately after, and 15 minutes after the Strange Situation Test. The results showed that securely attached dogs had lower cortisol reactivity than insecurely-disorganized attached individuals. This aligns with predictions of the attachment theory and studies with human children (Spangler & Schieche, 1998). The owner's personality had an influence too. Owners with high ratings in neuroticism and agreeableness had dogs with a cortisol decrease. Owners who were insecurely-ambivalent attached to their dogs had dogs with high cortisol reactivity, as well as owners who saw their dogs as

social supporters. Schöberl et al. (2016) argued that owners who saw their dogs as social supporters cannot fully serve as reliable calming caregivers. They concluded that the attachment classification system used for humans may also be applicable for dogs because they found similar results in attachment and stress coping. Furthermore, they suggested that dog and owner personalities and characteristics influence the stress coping ability of dogs.

The results of Schöberl et al. (2016) laid the foundation for further studies such as those of Solomon et al. (2019), which systematically applied the Ainsworth classifications to the human-dog relationship. The exploratory study of Solomon et al. (2019) aimed to develop a standardised method to measure the human-dog bond, making it easier to investigate how the interaction between dog and owner influences the well-being of the dog and whether secure attachment patterns have similar effects on dogs as on human infants. Furthermore, they wanted to contribute to the understanding of the evolution of attachment bonds by adding another comparative study about attachment. The dog-human dyads participated in this study were recruited from a larger study. There were two test procedures. The first one was a test with a threatening stranger. The dog was confronted with the stranger one time with the owner present, one time without. The second test was the Strange Situation Test. The results of the SST showed that the explorative behaviour of the dog was dependent on the episode. The dogs showed less exploration while separation from their owner, however, the secure base effect could not be fully demonstrated, because the expected increase in exploration between the separation and reunion episodes were not significant. The variable independent play was high in the pre-separation episode, decreased while the separations and increased again in the phases between separation and reunion, which was expected due to the secure base effect. Whimpering was also higher in the separation episode than in the reunion episodes. Important for attachment theory, the results furthermore showed that the dogs searched more for body contact with the owner in the reunion episodes than with the stranger in the separation episodes. Solomon et al. (2019) had a look on the attachment patterns and how they are distributed over the dogs in their study. The distribution was 61% secure, 6% insecure-avoidant, 14% insecure-ambivalent, and 20% disorganized, which fits good with the distribution found in a meta-analysis of Van IJzendoorn et al. (1999), just the avoidant group seemed a bit under represented. When including the disorganized group in their best fitting group of one of the others, the distribution is very similar to the one in Ainsworth et al. (1978) with human infants. The last part of that study was to investigate the influencing variables on the attachment security. As expected, dogs with supportive and sensitive owners were more likely to be securely attached than those without such owners and active/excitable dogs were less likely to be rated as securely attached. Therefore, the study of Solomon et al. (2019) indicates that the Ainsworth Strange Situation Test and Ainsworth's classification system is feasible also for describing and investigating the dog-human relationships. They furthermore show that the attachment pattern reflects the quality of the bond itself between dogs and their owners, especially in case of a secure attachment which aligns with findings in human studies (Van IJzendoorn, 1995).

It is widely known that pets, especially dogs, can have a positive impact on the mental health and well-being of their human caregivers. Moreover, it is interesting that the attachment level of the owner to its

dog is positively correlated with mental health and well-being of their caregiver (George et al., 1998). But the relationship dogs have with their owner cannot only influence the behaviour and health of the owner, it can also influence the behaviour of the dog in various ways (Wedl et al., 2010). In a study of Topál et al. (1997) the relationship had an influence on the behaviour of the dog in an unfamiliar open field test and on the problem-solving ability of the dog. Topál et al. (1997) compared two groups of dogs. One group was held inside the house in a “companion relationship” and the other group was held outside the house in a “working relationship”. In the unfamiliar situation the dogs living inside the house followed the owner more frequently. In the problem-solving task the companionship group glanced more at the owner, started to manipulate later and generally showed a more dependent behaviour than the working group. One of the conclusions of the study was that dogs considered as family members tend to behave socially dependent. Furthermore, the results showed that one consequence of the canid’s domestication process was that dogs are able to form social units with humans (Topál et al., 1997).

The attachment of the owner can affect the attachment of the dog, too. One study which investigated this topic is the study of Siniscalchi et al. (2013). That study looked for associations between the owners’ attachment assessed through a semi-projective method, the 9 Attachment Profile (9AP), and the dogs’ attachment assessed through the Ainsworth Strange Situation Test. Based on the results of the 9AP the owners were divided into confident and not-confident owners. Dogs from confident owners explored less while the owner was absent, but this was not the case for dogs with not-confident owners. In episode 4 when the owner entered the room dogs from not-confident owners explored more. This effect was even bigger when the owner entered the room in episode 6. Furthermore, dogs from not-confident owners explored significantly more than dogs from confident owners. In the first separation episode dogs from not-confident owners played significantly more with the stranger than dogs from confident owners. In both reunion episodes dogs from confident owners played more with their owners than dogs from not-confident owners. In the separation episodes dogs from not-confident owners approached the stranger more often than dogs from confident owners. Dogs bonded with not-confident owners scratched more at the door while separation than dogs bonded with confident owners. Physical contact with the owner during the first reunion was higher for dogs with not-confident owners but this effect was revealed during the second reunion. The results show a correlation between the owner’s attachment profile and the dog’s behaviour in the Strange Situation Test (Siniscalchi et al., 2013).

The study of Rehn et al. (2017) investigated a similar topic. They looked if the owner’s adult attachment style (AAS) had an influence on the way the dogs interact and obtain support from them during challenging situations. Shortly, the AAS describes how one individual handles relationships to other individuals (Hazan & Shaver, 1987), but it also reflects the person’s caregiving style (Mikulincer & Shaver, 2007, as cited in Rehn et al., 2017). The owners’ AAS was determined via an Adult Attachment Style Questionnaire. To look at the influence on the dog’s behaviour, the dog-owner dyads were exposed to five different challenging events. Results showed that dogs from owners scoring higher on the confidence scale were more likely to be oriented towards the visual and auditory stimulus and had a lower latency to approach the visual stressor. They were also less likely to stand behind the owner while they were confronted with the “Ghost”. Owners with higher anxiety attachment ratings, had dogs which

were more oriented towards the owner during the approaching person and the visual stressor test. They also stayed closer to the owner while the visual stressor. While reunion they showed less tail wagging. The dogs of owners scoring high on the avoidant attachment scale, were more oriented towards their owner while the visual stressor and less towards the stressor in the auditive stressor test. These dogs needed longer to approach the source of stressor in the visual stressor test, were more often behind the owner during the auditive stressor but were less close to their owner while the approach test. The study revealed a potential correlation between the owner's AAS and the dog's behaviour in threatening or challenging situations (Rehn et al., 2017).

In the study of Konok et al. (2015) they gave evidence that the owners attitudes towards their family dogs contributed to the development of a Separation-Related Disorder (SRD) in theirs dogs. The study was done in Hungary and Germany. The owners had to fill out different questionnaires about their attachment to their dog, the separation behaviour of their dog and the personality of their dog. The results showed that in Hungary the ratio of dogs having SRD was higher than in Germany. The number of dogs with SRD increased with the number of avoidant owners in a similar slope in both countries. Interestingly, the owner's personality had no influence on the occurrence of SRD. The results underpin the fact that the owner's behaviours towards their dog have an effect on the behaviour of the dog, potentially leading to serious behaviour problems like SRD (Konok et al., 2015).

The study of Cimarrelli et al. (2016) showed via questionnaires and behavioural observations some correlations between owner interaction styles and dog behaviour. The questionnaire was about general information and about the owner's personality. The owner-dog pairs participated furthermore in 8 tests to investigate their interaction style and a ninth test with a threatening stimulus evaluating the dog's reaction. The results showed a correlation between the proximity seeking behaviour in a threatening situation and the "Owner warmth" and enthusiasm. Moreover, they found out that the aggressiveness towards the threatening person tended to correlate with "Owner control" (Cimarrelli et al., 2016). These findings highlight the significance of examining such relationships in understanding the dynamics of the dog-owner bond.

### *Cultural differences*

The attachment bond is a biological function which is highly variable and susceptible (Ainsworth et al., 1978; Cimarrelli et al., 2016; Grossmann et al., 1985; Grossmann & Grossmann, 2006; Rehn et al., 2017; Rothbaum et al., 2000; Schöberl et al., 2016; Van IJzendoorn & Kroonenberg, 1988). Various aspects like the historical background of a country, socioeconomic factors or attitudes towards pets may have an influence on the dog-keeping practices and therefore on the bond between a human and its dog. It is remarkable that dogs were able to find their way to humans despite the changes in social systems and cultural traditions while the human evolution. There are just a few studies which have analysed the cross-cultural effect of dog ownership (Bekova & Makenov, 2018; Kobelt et al., 2003; Shore et al., 2006; Smith et al., 2022). In a questionnaire-based study of Szánthó et al. (2017) where they analysed how the dogs behaviour in some emotional situations was described by their owners, they found out that in Hungary dogs live more often outside the house than in Germany, although the Hungarian owners

agreed more with the sentences "I have no problems with my dog at all; My dog thinks like a child; My dog means more to me than any human being". Wan et al. (2009) did a cross-cultural comparison on dog-keeping practices and dog behaviour just with questionnaires between German Shepherd owners in Hungary and the USA. The results showed for example that owners from the USA were more likely to keep their dog indoors than owners from Hungary, 88% of the owners from the USA called their dogs "family member" or "companion" whereas only 26% of the Hungarian owners called their dogs "family member" or "companion". The owners from the USA also trained their dogs in a higher variety of activities. In contrast, in a study of Fielding and Plumridge (2005), where they tried to find a description of what is meant by "owning" a dog in New Providence, The Bahamas, they stated that over 70% of the dogs there were kept outside the house. They also mentioned that most of the dogs there were held as guard or watching dogs, but they are also held as pets or companions. Fielding and Plumridge (2005) furthermore, brought up that it is harder for dogs who are kept outside to form bonds with their owners.

Shore, Douglas and Riley (2006) investigated if pets from owners which have already experience in owning a dog have more benefits. The participants of this study were students at a university in the Midwestern United States. During this study, they found out that the majority of dogs were kept primarily inside the house and that there was a relationship between the dogs' primary location and the respondents' ethnic group. The Lexington Attachment to Pets Scale (Johnson et al., 1992) was significantly higher for owners of house dogs than for those from yard dogs. The LAPS is a psychometric questionnaire which aims to rate the attachment of an owner to its pet. It includes statements which has to be answered on a 1 to 5 rating scale, with 1 meaning strongly disagree with the attachment and 5 strongly agree. They concluded that attachment of the owner to the dog was higher in house dogs.

The study of Kovács et al. (2018) investigated the environmental and genetic influences on the attachment bond of the dog in Austria and Hungary. They looked if oxytocin receptor polymorphism of the dog and the owner influences the attachment behaviour of the dogs and if these different genotypes are affected by factors like e.g. age and sex. Furthermore, they also analysed if the owner's personality, attachment style and the attachment to pets had an influence on the dogs attachment. The participants were only Border Collies and their owners. The behavioural test was an Ainsworth Strange Situation Test and the DNA samples were collected via buccal cell samples. The owners also had to fill out a questionnaire to examine their personality, romantic relationships and dog-owner relationship. The results showed some correlations between the polymorphisms in the dog as well as in the owners which influenced the attachment behaviour of the dog. This leads to the assumption that the genetics of the dog and the owner have an influence on the attachment bond. The attachment style in romantic relationships and towards dogs had an influence on the attachment bond of the dog. Owners who showed lower avoidance in romantic relationships had dogs with a stronger attachment. At the same time, higher pet-related avoidance in owners was associated with a stronger attachment in their dogs (Kovács et al., 2018). For this study especially relevant is the fact that the results showed a higher attachment and anxiety while separation in Hungary than in Austria. The study of Kovács et al. (2018) gives evidence that the genetic profile of the dog as well as the owners can have an influence on the

attachment bond and it is another study which highlights that environmental factors like the owners personality or the country can have an influence on the dogs attachment.

### *Aims of study*

The aim of this study was to explore potential cultural differences in how owners perceive their attachment to their dogs and their dogs' attachment to them. Additionally, the study sought to examine cultural variations in owners' anthropomorphic attitudes and investigated whether cultural differences are reflected in the attachment behaviour of the dogs, given the limited research on cross-cultural differences and their impact on the dog-owner relationship. This study mainly focused on Vienna and Budapest and their suburban areas. These are two cities which are near each other, similar in their size, inhabitants and how the cities are structured and their dog keeping practices. This gives the opportunity to have a look on the attachment of owners and dogs in two similar structured cities and their suburban areas. The owners had to fill out a questionnaire with questions about the reason they got the dog and three scales, one about the attachment of the dogs towards the owner, one about the attachment of the owner and one about the anthropomorphic attitudes of the owner. Additionally, I analysed video recordings of the same Hungarian dog-owner pairs in a modified version of the Ainsworth Strange Situation Test. The Austrian videos already had been coded as a part of a larger project. Based on previous findings into the study of Wan et al. (2009) that Hungarian dogs tend to be kept more outside than German dogs and that it is harder for dogs who live outside to form bonds with their owner stated by Fielding & Plumridge (2005), I came up with the following hypotheses and predictions: My first hypothesis was that dogs in Austria would be seen as 'real' family members more often than dogs in Hungary (compare Fielding & Plumridge, 2005; Shore et al., 2006; Wan et al., 2009). My prediction was that in the questionnaire the reason to have a dog was more often answered with "family member", "friend", or any other word for a beloved individual from Austrian owners than from Hungarian owners. Moreover, I predicted that in the questionnaire, the three scales were rated higher for dogs in Austria than in Hungary. My second hypothesis was that there was a cultural difference in case that Austrian dogs showed more attachment behaviour in the SST than the Hungarian (see also Fielding & Plumridge, 2005; Topál et al., 1997; Wan et al., 2009). I predicted that the dogs from Austria were more in proximity of the owner, followed the owner more often/longer inside the room, sat longer next to the door when the owner was absent and that the intensity of the greeting behaviour of the Austrian dogs was higher. My third hypothesis was that within the two countries, dogs which had higher ratings in the three scales, also showed a greater attachment bond to their owners (compare Ainsworth et al., 1978; Cimarelli et al., 2016; Siniscalchi et al., 2013; Solomon et al., 2019). I predicted that dogs with high ratings in the three scales were more in proximity of the owner, followed the owner more often/longer, sat longer next to the door when the owner was not in the room and the intensity of the greeting behaviour of the dog was higher.

## Methods and Materials

### *Participants*

The Austrian pairs were recruited through a database of the Clever Dog Lab Society in Vienna. The Hungarian sample was recruited from a database of the Family Dog Research Program at the Department of Ethology of the Eötvös Loránd University in Budapest (Horn et al., 2013). All participants participated voluntarily in this study. There were no special criteria the dog and owners had to fulfil, only that the dog had to be at least adult. Most of the Austrian dog-owner pairs were from the city of Vienna, including the suburban areas around Vienna; most of the Hungarian dog-owner pairs were from the suburban area around Budapest but also from the city of Budapest directly.

### *Data set*

The data of this study was from a larger project, which was done in 2009 and 2010. The video recordings of the Austrian sample have already been coded as part of that larger project.

In total there were 89 videos from Hungary, out of which 74 were with female owners, 13 were with male owners and in 2 cases there was no information about the owners. I analysed 84 videos of owner-dog pairs from Hungary using the same coding scheme that has already been used for the videos from Austria. The remaining 5 videos I did not code because of time issues. According to the Fédération Cynologique Internationale the dogs fit into seven groups: 0 (Mixed), 1 (Sheepdogs and Cattle dogs (except Swiss Cattle dogs), 3 (Terriers), 5 (Spitz and primitive types), 7 (Pointing dogs), 8 (Retrievers, Flushing Dogs, Water Dogs) and 9 (Companion and Toy dogs). The dogs were between 0.6 and 17 years (mean  $\pm$  SD =  $4.1 \pm 2.88$ ).

In my statistical analysis only dogs out of the FCI groups 0, 1, 5 and 9 were included, because the Austrian dogs were only out of these groups and to have a clear data set and exclude breed influences in one country, just dogs out of these four groups were taken in Hungary too. The total number of dogs included for my statistical analysis therefore was 77 from Austria and 77 from Hungary. I counterbalanced for sex and age by including nearly the same number of male and female dogs for both countries and trying to have nearly the same ages in both samples. In total I had 36 females and 41 males from Austria, and 33 females and 44 males from Hungary.

### *Questionnaire*

The owners filled in a questionnaire about the dog-human relationship with five sections. In section A the owners had to fill out some general questions about their dog e.g. name, sex, training. Section B was about the attachment of the dog towards their owner. The questions in this section were from parts of the questionnaire 'Canine Behavioral Assessment and Research Questionnaire' used from Hsu & Serpell (2003), where the attachment of the dog was relevant. Section C was about the attachment of the owner towards their dog. This section was the entire 'Attachment to Pets Scale' from Johnson et al. (1992). Section D was about the anthropomorphic attitudes of the owner. This section was a collection of different questionnaires: Questionnaire for Anthropomorphic Attitudes (Topál et al., 1997), Dog related consumer behaviour (Dotson & Hyatt, 2003) and Ascribed Emotions Questionnaire (Morris et

al., 2008). Section E was about general information of the owner and the reasons why they bought their dog. Section B, C and D had statements written with a scale of 5 numbers, where 1 meant strongly disagree and 5 meant strongly agree with the statement.

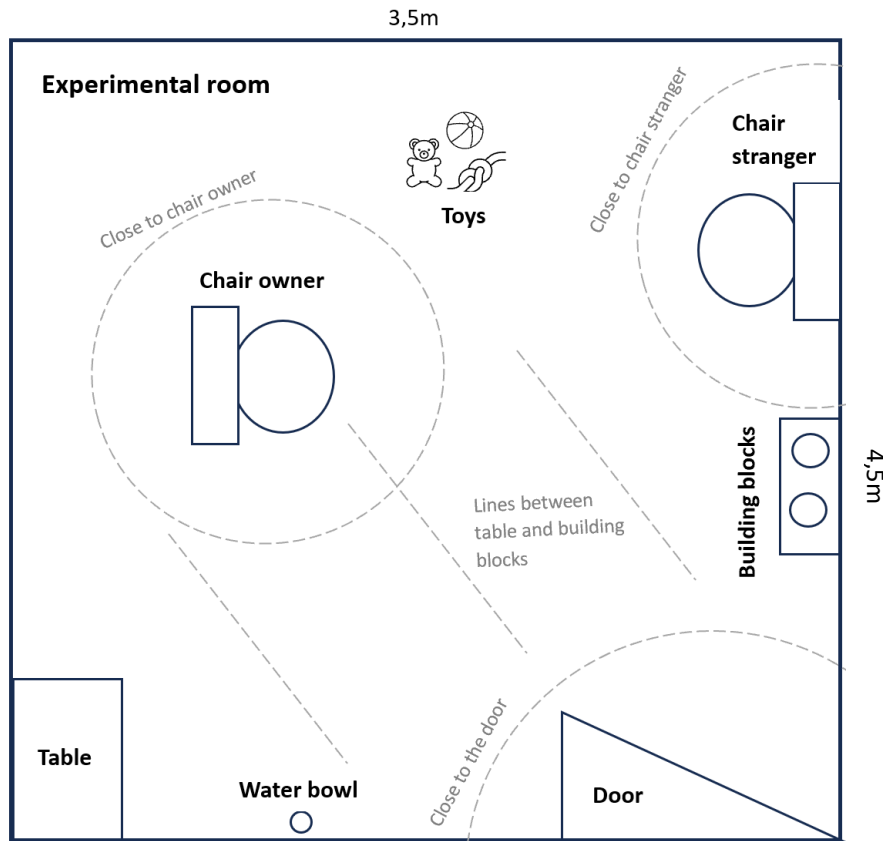
In addition, I categorized the reason to buy a dog in function or love. In the category love, I put every dog where the reason to have a dog was answered with friend, love, or any other word for a beloved individual. In the category function, I put every other answer which fit not in category love e.g. companion, guarding dog, sports partner. There were 5 dogs in total where the question was not answered.

### *Experimental procedure*

The basic experimental setup was similar to the Strange Situation Test (SST) done from Topál et al. (1998). The strange situation was simulated by a room, unfamiliar to the dog and 7 episodes of separation and reunion of the dog and its owner. The room in Austria was 5m x 6m and in Hungary it was 3.5m x 4.5m. In the room there were two doors (one was locked throughout the whole procedure), two chairs, a selection of toys for the dog, one small table, one small wardrobe with building blocks on it and one water bowl. The room itself was divided into different zones, which were marked on the floor with adhesive tape to make the behavioural coding easier (Fig.1). The experimental procedure consisted of 7 episodes which were 3 minutes. Episodes where the dog was alone could be shortened (this was the case in 6 dogs in Austria) in case the dog was too distressed, but at least 1min long. Every pair was video recorded, which were analysed afterwards. The videos were around 25min long.

- Episode 1: Dog and owner in testing room.
  1. Owner sits on the chair.
  2. Owner puts building blocks from wardrobe in the room to table.
- Episode 2: Owner, stranger and dog in testing room.
  1. Stranger comes in and takes a seat on the chair.
  2. Stranger tries to play with the dog, while owner is present.
  3. Owner leaves the room, while the stranger tries to play with the dog.
- Episode 3: Stranger and dog in testing room.
  1. Stranger sits on the chair.
  2. Stranger puts building blocks from the table to the wardrobe.
  3. Stranger leaves the room.
- Episode 4: Dog alone in testing room.
- Episode 5: Owner and dog in testing room.
  1. Owner enters the room, waits 5sec before he/she greets the dog and then greets the dog.
  2. Owner takes a seat on the chair.
  3. Owner leaves the room.
- Episode 6: Dog alone in testing room.
- Episode 7: Stranger and dog in testing room.
  1. Stranger enters the room, waits 5sec before he/she greets the dog and then greets the dog.

2. Stranger takes a seat on the chair.
3. Stranger leaves the room with the dog.



**Figure 1. Experimental setup.** The room is 3.5m x 4.5m. There was one door where the participants came in. In the room there were two chairs which were opposite of each other, one table with building blocks on it and another table where to put the building blocks on while the experiment. There were taped circles around the chairs and door as a visual support for the video coding and taped lines from the table to the building blocks to count the crossings of owner and dog. Between the chair of the owner and the stranger were toys for the dog. A water bowl was between table and door.

### *Video coding*

All videos were coded with Solomon coder (© András Péter) and the statistics were done with R.

With the videos I coded different behaviours of the dog while the SST:

1. position of the dog: in proximity of the owner, of the stranger or the door (seconds) (Tab.1)
2. behaviour of the dog: exploring the room, locomotion in the room, passive behaviour in the room, playing (solitary, with owner, with stranger) (seconds) (Tab.2)
3. intensity of the greeting behaviour when the owner or stranger comes back (5-6 points scale) and if the dog wagged with the tail (Tab.3)

For my statistical analysis, I concentrated on the variables following the owner out of Episode 1, proximity to the owner out of Episode 1, 2 and 5, proximity to the door when the dog was alone out of Episode 4 and 6 and intensity of greeting when the owner returned out of Episode 5.

I only coded one position or behaviour at a time, with play being the most important, and then the positions were preferred over a behaviour. The behavioural categories and positions were coded via continuous coding and were coded as durations. For the following behaviour I counted the lines the dog crossed in the same direction as the owner, while the owner put the building blocks from one table to the other. The greeting intensity was recorded qualitatively with a score of 1 to 5 or 1 to 6, which was only recorded once per episode. A detailed description is written in Table 3.

**Table 1. Positions of the dog in the Strange Situation Test** (Horn, unpublished material)

| <i>Position</i> | <i>Detailed description</i>                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| at Owner        | Coding when at least one part of the dog's body (e.g., paw, nose, body; BUT: except the tail!) with full weight/complete contact touches the floor within the line of the circle around the owner's chair, stop coding as soon as the last body part (except the tail) has lifted from the floor within the circle. If the dog is standing/sitting/lying with more than half of a paw on the line of the circle continue coding "at owner". |
| at Stranger     | same as at Owner, but with the circle around the stranger                                                                                                                                                                                                                                                                                                                                                                                   |
| at Door         | same as at Owner, but with the circle around the door the pairs used to come into room                                                                                                                                                                                                                                                                                                                                                      |

**Table 2. Behavioural categories observed in the Strange Situation Test** (Horn, unpublished material)

| <i>Behaviour</i> | <i>Detailed description</i>                                                                                                                                                                                                                                                                                                                                                                               |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Explore room     | the dog is moving or standing in the room (outside the circles) and has the nose on or in close proximity of (approx. 10 cm, "one hand") the floor or any other surface (e.g., wall, table) or both front paws placed on an elevated surface (e.g., windowsill, table). Drinking is not included in this variable!                                                                                        |
| Locomotion room  | any movement of the dog in the room (outside the circles), without having the nose on or in close proximity of (approx. 10 cm, "one hand") the floor or any other surface (e.g., wall, table). If the dog is drinking from the water bowl – this is coded as locomotion. When the dog is moving, stops for a short period to scratch itself, and then continues moving, this is also coded as locomotion. |
| Passive room     | standing (with all 4 paws on the floor, legs not moving), sitting, or lying in the room (outside the circles), without having the nose on or in close proximity of (approx. 10 cm, "one hand") the floor or any other surface (e.g., wall, table).                                                                                                                                                        |

|      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Play | <p>Solitary play: Coding play for the first time (toys in the original position) when the dog moves the toy with mouth or paw; for every later bout, it's play from the frame where the playing "intention" is obvious (e.g., lifted paw, open mouth). Continue coding play when the toy is in the mouth, moved with the paw, the dog is following toy's movement with head; however, the dog must be within about 2 m of the toy (unbroken eye contact must be identifiable), if eye contact is disrupted (i.e., as soon as dog drops ball and looks away) playing is stopped. Playing starts again only with a clear playing intention. Play stops if dog drops ball/rope, and/or breaks eye contact with it.</p> <p>Play with stranger: While the toy is in the stranger's hand, coding play as soon as the dog approaches the toy with the nose to a distance of at least 5 cm. Therefore, unlike solitary play, play can be recorded BEFORE the dog gets in contact with the toy. For toys that are not in the stranger's hand, playing is from the frame where the playing "intention" is obvious (e.g., lifted paw, open mouth). When the toy is in the stranger's hand, it's playing when the dog is orientating towards ball and following with eyes. For toys that are not in the stranger's hand, it's still playing when the toy is in the mouth, moved with the paw, the dog is following toy's movement with head, unbroken eye contact over a distance of about 2 m (same as in the solitary play) Play stops if dog drops ball/rope, and/or breaks eye contact with it.</p> |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Table 3. Greeting intensity of the dog in the SST** (Horn, unpublished material)

| Score | Definition                                                                                                                                                                                                                                                               |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0     | dog does not approach, does not look at owner/stranger                                                                                                                                                                                                                   |
| 1     | dog does not approach, looks at person                                                                                                                                                                                                                                   |
| 2     | dog does not approach, looks at person, wags tail (the tail must wag at least a few times, but does not need to be continuous)                                                                                                                                           |
| 3     | dog approaches the person up to at least 0.5 m, does not wag                                                                                                                                                                                                             |
| 4     | dog approaches the person up to at least 0.5 m, wags tail (the tail must wag at least a few times, but does not need to be continuous)                                                                                                                                   |
| 5     | dog approaches the person closely, wags tail, jumps at person                                                                                                                                                                                                            |
| 6     | dog approaches the person up to at least 0.5 m before the person is in the region of the circle around his/her chair, wags tail, follows person from region of the approach into the circle (depending on episode owner/stranger), but only within the phase of greeting |

All behavioural elements of the description must be present in the dog to receive the score.

The scores 0-5 were possible in the first phase of the greeting episodes where the dog was not greeted of the owner for 5 seconds and in the phase afterwards where the dog was greeted by the owner. Score 6 was only possible in the second phase where the owner actively greeted the dog.

### *Data analysis*

For my statistical analysis absolute values of every variable were changed into the relative values. The relative value of the variable proximity to the owner was calculated by dividing the relative duration of the time staying in proximity of the owner by the total duration of the episode. This was done for every episode separately. The relative value of the variable staying close to the door was calculated in a similar manner by dividing the time in proximity to the door by the total duration of the episode. The greeting score was corrected for the maximum number of points that could have been achieved, which was different while the reunion with the owner (Tab.3). The raw value of the score was divided by 5 or 6 (Tab.3) to get the relative value.

I started testing if the three sectors of the questionnaire, "Attachment of the dog", "Attachment of the owner" and "Anthropomorphic attitudes of the owner", were internally consistent with Cronbach's Alpha. This was the case in all three of these sections, "Attachment of the dog" (raw\_alpha= 0.74), "Attachment of the owner" (raw\_alpha= 0.9) and "Anthropomorphic attitudes of the owner" (raw\_alpha= 0.80).

For the tests, I calculated an average of every section from the questionnaire. I also used the average for proximity to the owner out of the relative values of the episodes 1, 2 and 5, the average of the relative values for proximity to the door out of the episodes 4 and 6 and the average of the greeting intensity in episode 5.

At first, I tested for normal distribution of each of the variables. Done with taken the country into account (for the analysis of the Questionnaire data and the SST data) and also without taking the country into account (for the analysis of the correlations) (Tab.4).

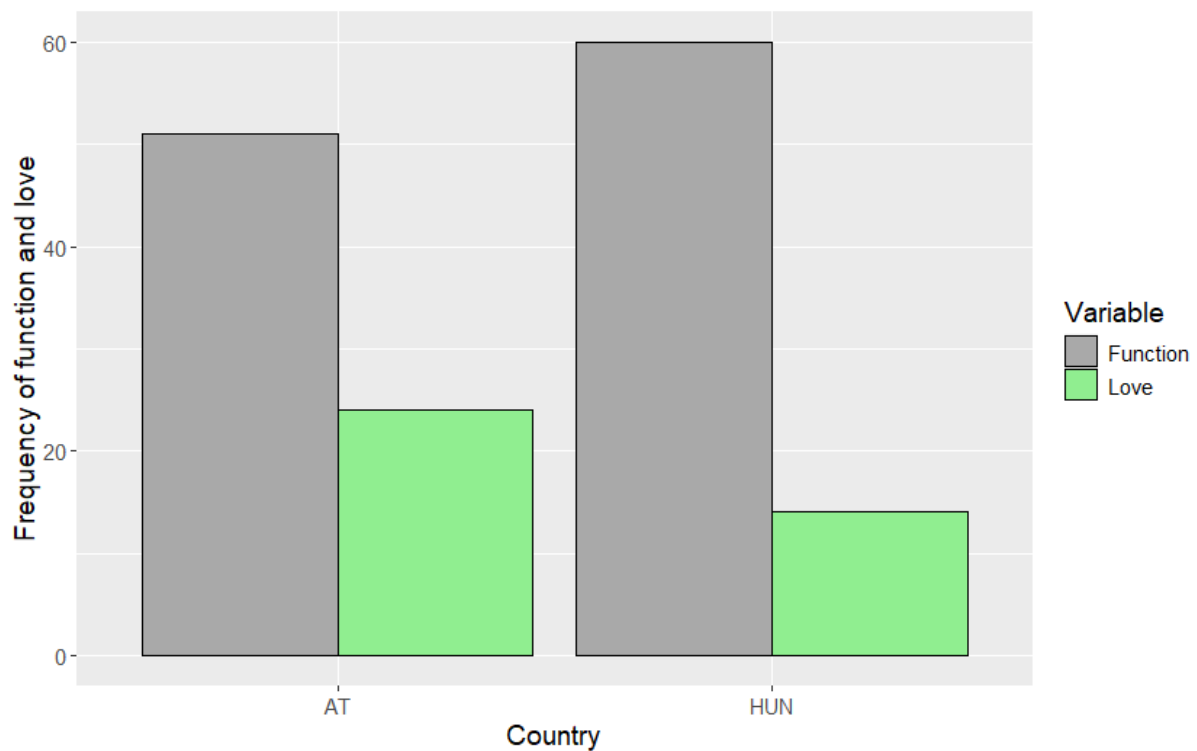
To test my first hypothesis, I tested for potential frequency differences in the reasons the owner bought their dog (love or function) with the chi-squared Test. To test if there were differences in the answers of the questionnaire between the countries, I did a Welch T-Test or a Mann-Whitney U test, depending on if it was normally distributed or not.

For my second hypothesis I used also the Welch T-Test or the Mann-Whitney U test to test for differences in the attachment behaviours between the two countries.

For all my correlations I used the Spearman correlation coefficient, because in every correlation was at least one not normally distributed variable (Tab.4). Afterwards, I did a Holm Bonferroni correction for multiple correlations.

## Results

The reason to buy a dog was in Austria answered 51 times with function and 24 times with love. In Hungary it was answered 60 times with function and 14 times with love. However, there was no significant difference in the frequency regarding the reason to buy a dog (love or function) between Austria and Hungary (X-squared = 2.70, df = 1, p-value = 0.100) (Fig.2).



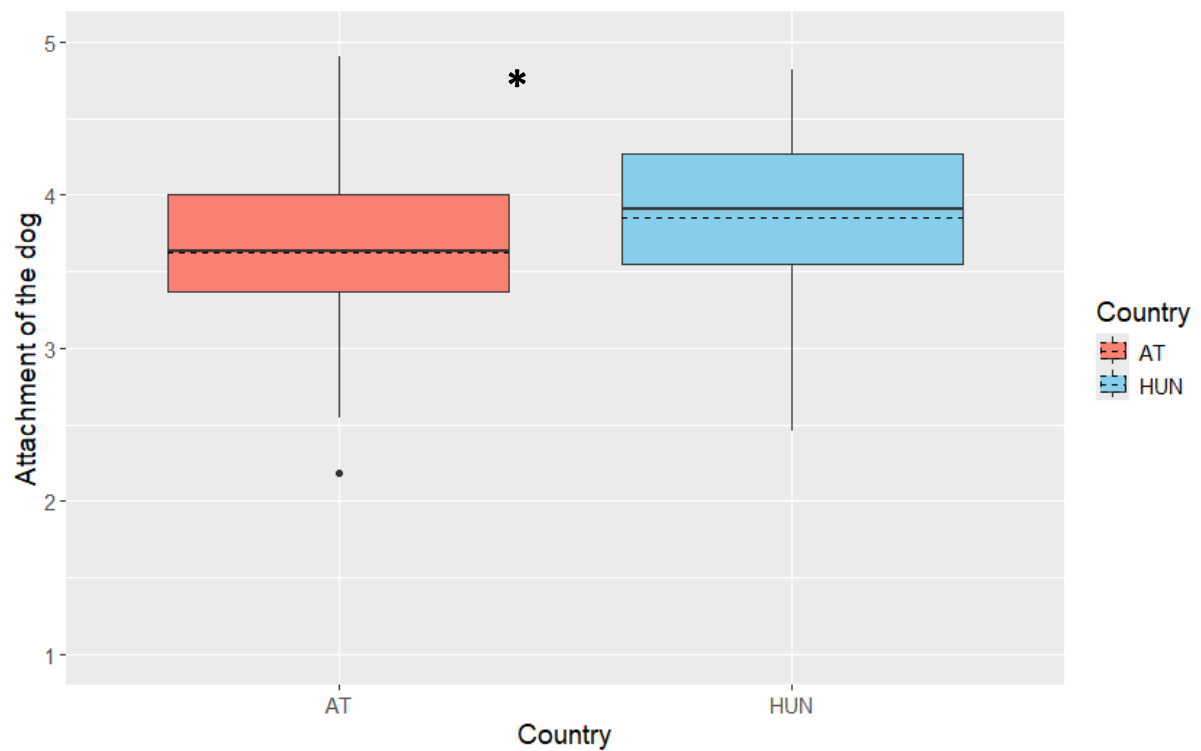
**Figure 2. Frequency of the reason (function or love) for getting a dog.** In the questionnaire there was one question about the reason the owners bought the dog, which was categorized in function or love for this study.

For the second part of my first hypothesis, I examined whether the questionnaire sections were all rated higher in Austria than in Hungary. At first, I tested for normal distribution of the variables (Tab.4). There was a significant difference in the “Attachment of the dog” between the two countries ( $W = 2257.5$ ,  $p\text{-value} = 0.011$ ) (Fig.3). The dogs from Hungary were rated higher in this category than the dogs from Austria (Austria: mean  $\pm$  SD =  $3.62 \pm 0.569$ , min = 2.18, max = 4.91; Hungary: mean  $\pm$  SD =  $3.85 \pm 0.581$ , min = 2.46, max = 4.82). For the “Attachment of the owner” there was no significant difference found between the two countries ( $W = 2923.5$ ,  $p\text{-value} = 0.884$ ) (Austria: mean  $\pm$  SD =  $3.88 \pm 0.585$ , min = 1.83, max = 4.96; Hungary: mean  $\pm$  SD =  $3.89 \pm 0.57$ , min = 2.52, max = 4.91). Because the sector “Anthropomorphic attitudes of the owner” was normally distributed in both countries, I tested for similar variances ( $F = 1.07$ ,  $df = 76$ ,  $p\text{-value} = 0.772$ ). The rating in the sector “Anthropomorphic attitudes of the owner” were significantly higher in Hungary than in Austria ( $t = -$

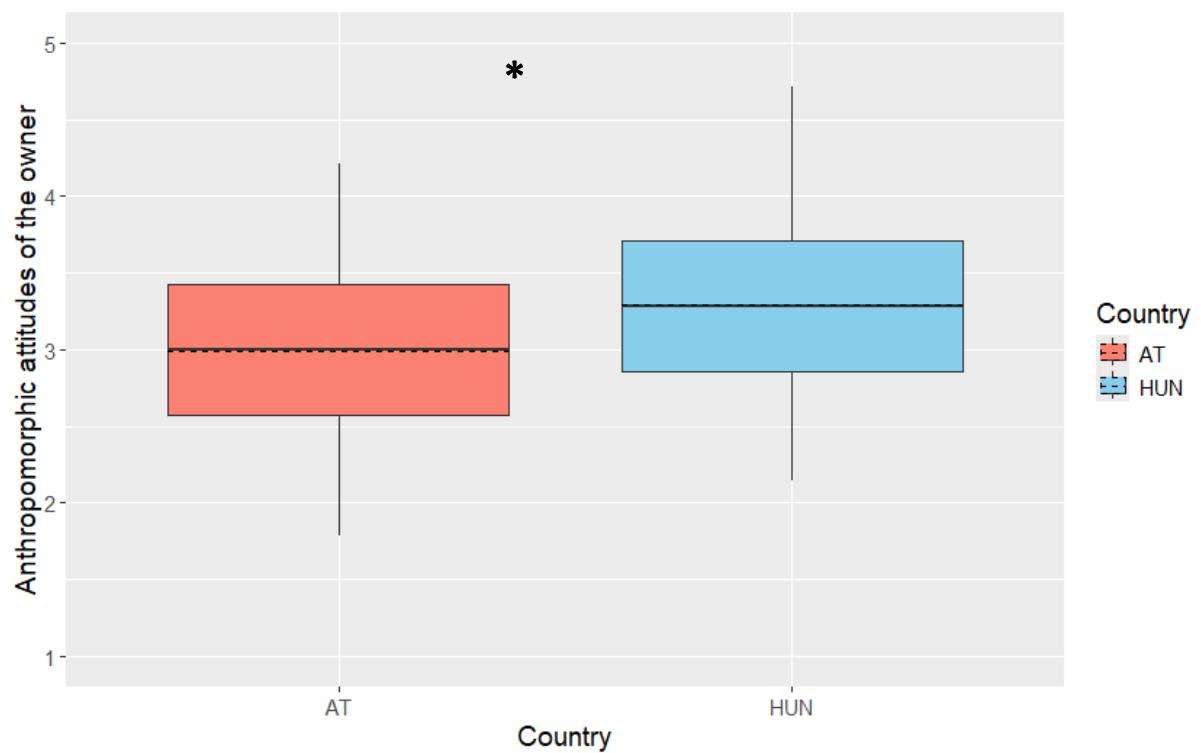
3.13, df = 151.83, p-value = 0.002) (Austria: mean  $\pm$  SD = 2.992  $\pm$  0.612, min = 1.79, max = 4.21; Hungary: mean  $\pm$  SD = 3.3  $\pm$  0.592, min = 2.14, max = 4.71).

**Table 4. Shapiro-Wilk Test Questionnaire sections and Strange Situation Test.**

| <i>Section</i>                        | <i>Country</i> | <i>W</i> | <i>p-value</i>   |
|---------------------------------------|----------------|----------|------------------|
| Attachment of the dog                 | Austria        | 0.98     | 0.496            |
|                                       | Hungary        | 0.97     | 0.044            |
|                                       | both           | 0.98     | 0.035            |
| Attachment of the owner               | Austria        | 0.97     | 0.049            |
|                                       | Hungary        | 0.95     | 0.007            |
|                                       | both           | 0.97     | <b>0.002</b>     |
| Anthropomorphic attitude of the owner | Austria        | 0.98     | 0.225            |
|                                       | Hungary        | 0.98     | 0.269            |
|                                       | both           | 0.99     | 0.244            |
| Proximity to the door                 | Austria        | 0.91     | <b>&lt;0.001</b> |
|                                       | Hungary        | 0.88     | <b>&lt;0.001</b> |
|                                       | both           | 0.90     | <b>&lt;0.001</b> |
| Proximity to the owner                | Austria        | 0.89     | <b>&lt;0.001</b> |
|                                       | Hungary        | 0.88     | <b>&lt;0.001</b> |
|                                       | both           | 0.88     | <b>&lt;0.001</b> |
| Following the owner                   | Austria        | 0.85     | <b>&lt;0.001</b> |
|                                       | Hungary        | 0.94     | <b>&lt;0.001</b> |
|                                       | both           | 0.91     | <b>&lt;0.001</b> |
| Greeting intensity                    | Austria        | 0.60     | <b>&lt;0.001</b> |
|                                       | Hungary        | 0.78     | <b>&lt;0.001</b> |
|                                       | both           | 0.90     | <b>&lt;0.001</b> |

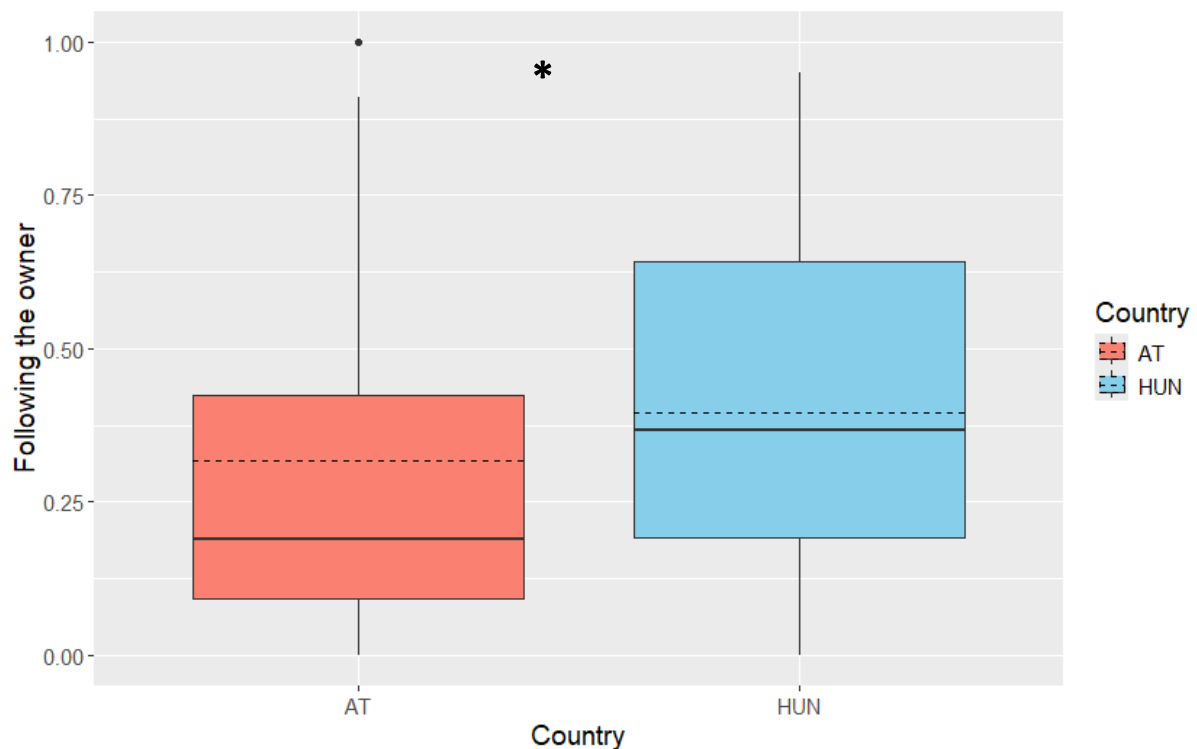


**Figure 3. Attachment of the Dog in Austria and Hungary.** Score (1 – strongly disagree, 5 – strongly agree) of the section “Attachment of the dog” from the questionnaire for the Austrian and Hungarian Dogs. Shown are the median (continuous line), the mean (dashed line), the four quartiles (each representing 25% of the data) and the outlier.

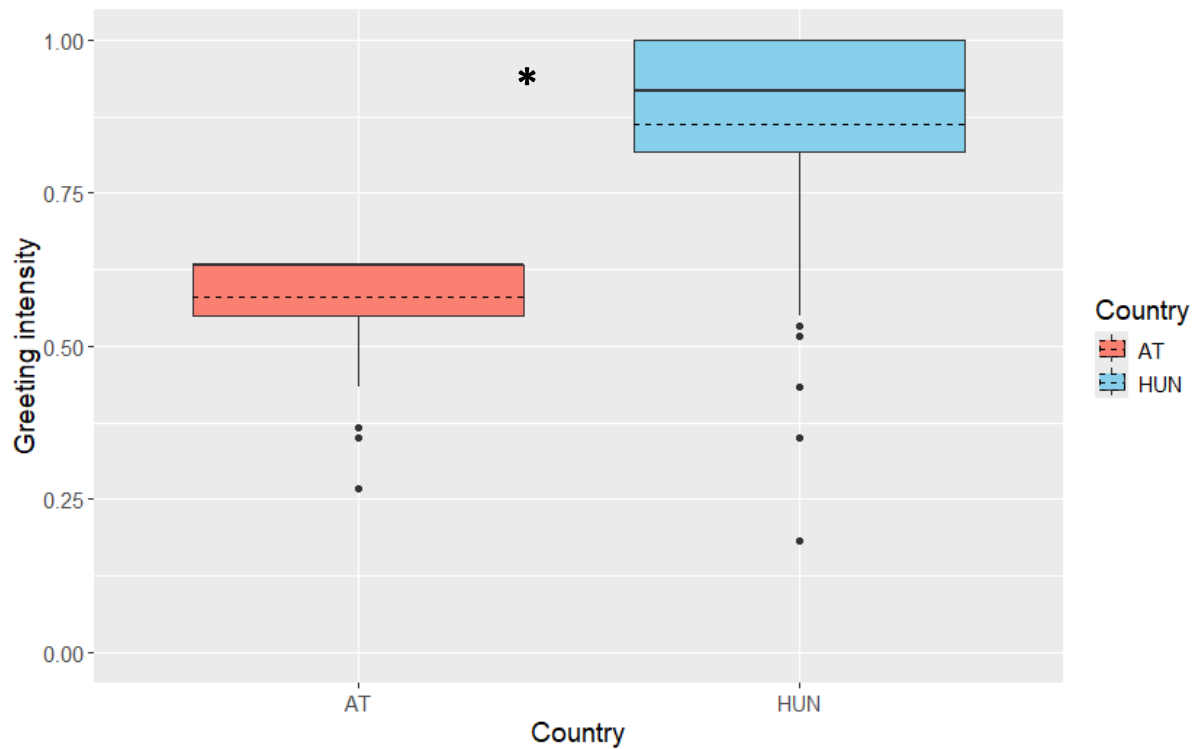


**Figure 4. Anthropomorphic attitudes of the owner.** Score (1 – strongly disagree, 5 – strongly agree) of the section “Anthropomorphic” from the questionnaire for the Austrian and Hungarian Dogs. Shown are the median (continuous line), the mean (dashed line), the four quartiles (each representing 25% of the data) and the outlier.

When investigating the attachment behaviour in the SST I found out that there was no significant difference between the two countries in the time the dogs spent near the door when the owner was absent ( $W = 3034$ ,  $p\text{-value} = 0.803$ ) (Tab.5). There was also no significant difference in the time the dogs spent in proximity of the owner between the countries ( $W = 3422$ ,  $p\text{-value} = 0.099$ ) (Tab.5). However, the Hungarian dogs followed the owner significantly more than the Austrian dogs ( $W = 2388.5$ ,  $p\text{-value} = 0.037$ ) (Fig.5, Tab.5). The greeting intensity differed significantly between Austria and Hungary ( $W = 627$ ,  $p\text{-value} < 0.001$ ) with the Hungarian dogs having a higher greeting intensity (Fig.6, Tab.5).



**Figure 5. Following behaviour of the dog in the SST.** The numbers on the y-Axis are the relative ratio of the lines crossed by dog and owner. Shown are the median (continuous line), the mean (dashed line), the four quartiles (each representing 25% of the data) and the outlier. 0 means the dogs did never cross the line in their owners direction, 1 means the dogs did cross as many lines in the same direction as the owner.



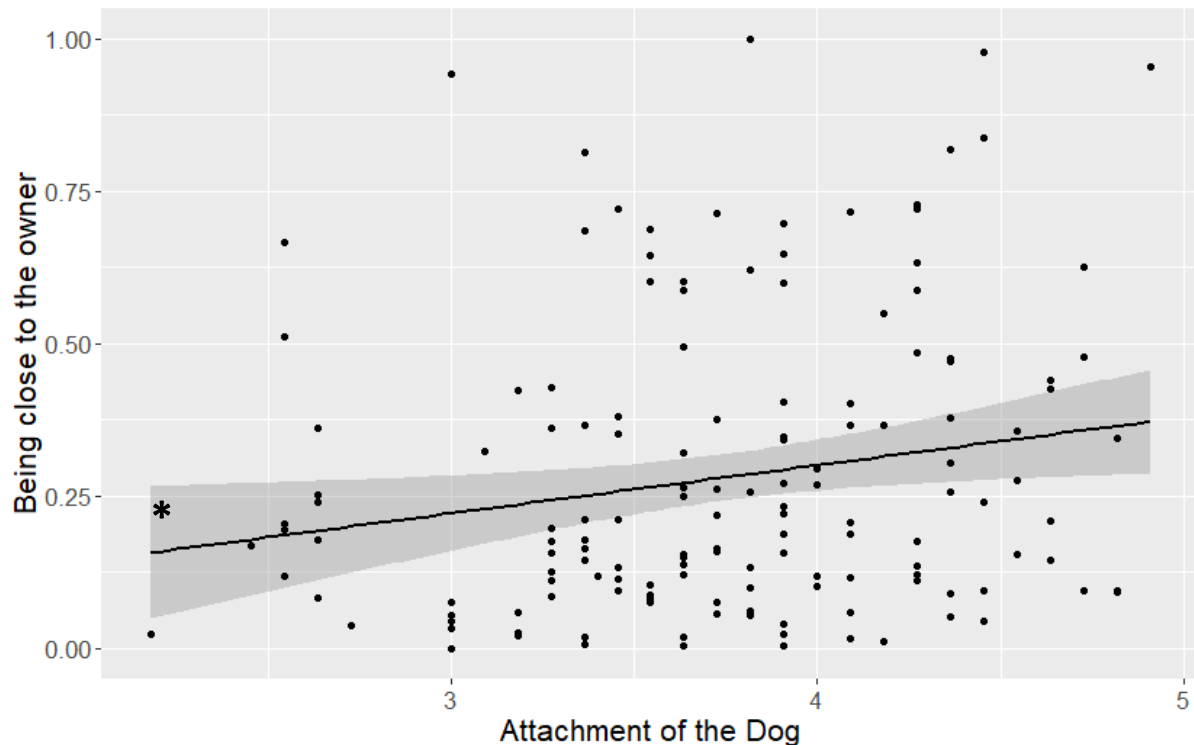
**Figure 6. Greeting intensity of the dog in the SST.** The numbers on the y-Axis show the relative ratio of the greeting intensity in Episode 5. Shown are median (continuous line), the mean (dashed line), the four quartiles (each representing 25% of the data) and the outlier. 0 means low intensity, 1 means high intensity.

**Table 5. Strange Situation Test**

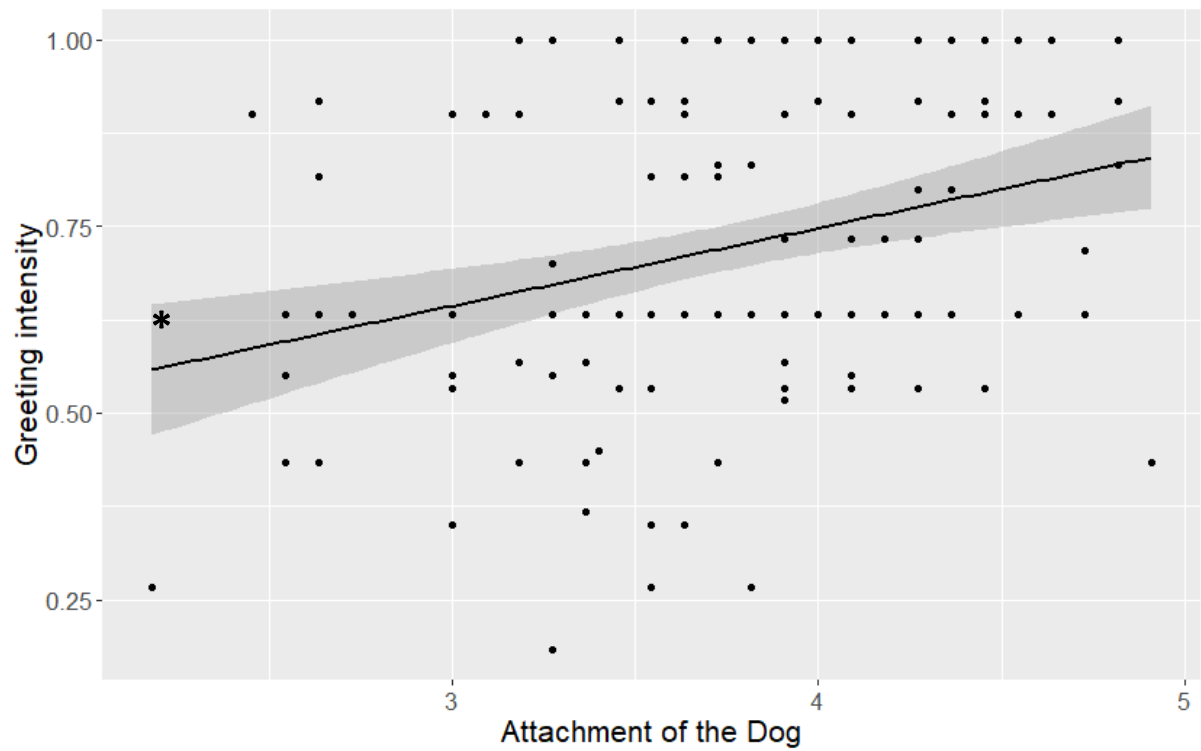
| Variable               | Country | Mean | SD    | Min  | Max  |
|------------------------|---------|------|-------|------|------|
| Proximity to the door  | Austria | 0.44 | 0.335 | 0.00 | 1.00 |
|                        | Hungary | 0.43 | 0.341 | 0.00 | 1.00 |
| Proximity to the owner | Austria | 0.32 | 0.272 | 0.00 | 1.00 |
|                        | Hungary | 0.24 | 0.205 | 0.00 | 0.84 |
| Following the owner    | Austria | 0.32 | 0.300 | 0.00 | 1.00 |
|                        | Hungary | 0.40 | 0.284 | 0.00 | 0.95 |
| Greeting intensity     | Austria | 0.58 | 0.100 | 0.27 | 0.63 |
|                        | Hungary | 0.86 | 0.177 | 0.18 | 1.00 |

In this experiment I correlated at first every of the three sectors from the questionnaire with following attachment behaviours in the Strange Situation test, without taking the country into account: Proximity to the door, proximity to the owner, following the owner, greeting intensity. Only the corrected p-values were considered. There were just two significant correlations. The “Attachment of the dog” was positively correlated with the proximity to the owner ( $\rho = 0.20$ ,  $p\text{-value} = 0.038$ ) (Tab.6). Dogs which were rated high in the “Attachment of the dog” were also longer in the proximity of the owner (Fig.7). The “Attachment of the Dog” and the Greeting behaviour of the dog were significantly correlated too ( $\rho = 0.31$ ,  $p\text{-value} < 0.001$ ) (Tab.6). Dogs which were rated high in “Attachment of the dog” also had

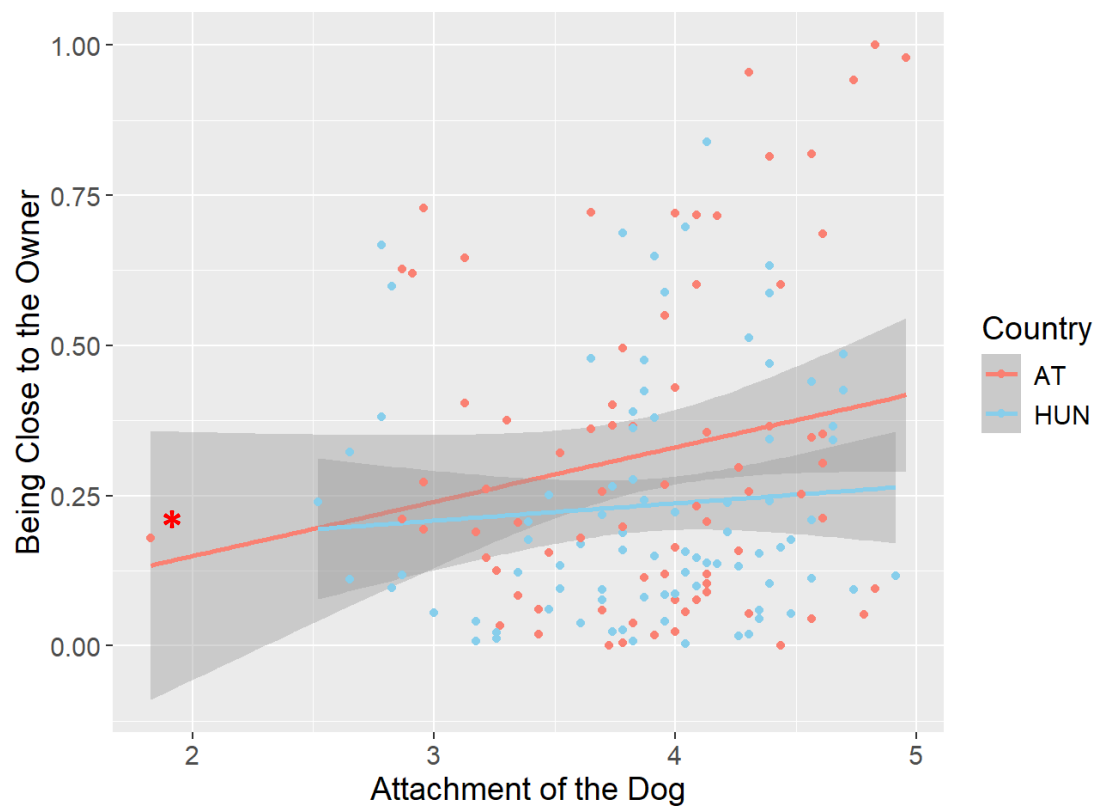
a higher greeting intensity (Fig.8). All other correlations were non-significant (Tab.6). Furthermore, to check whether there were any differences between the two countries for these associations, I did correlations for Austria and Hungary separately. In Austria dogs with high ratings in “Attachment of the dog” were also significantly longer at the owner ( $\rho=0.38$ ,  $p\text{-value} = 0.003$ ) (Fig.9, Tab.7). All other Austrian correlations were not significant, as well as all Hungarian correlations (Tab.8).



**Figure 7. Correlation between the Attachment of the Dog and proximity to the owner.** Shown is the correlation of the average for both countries together for the “Attachment of the dog” and the average of the proximity of the owner also for both countries. The x-axis shows the “Attachment of the dog” and the y-axis shows the proximity to the owner. The line is the trendline with its confidence interval. On the x-Axis 1 means strongly disagree, 5 means strongly agree. On the y-Axis, 0 means no time spent in proximity of the owner, 1 means the whole time in proximity of the owner.



**Figure 8. Correlation between the Attachment of the Dog and Greeting intensity.** Shown is the correlation of the average for both countries together for the “Attachment of the dog” and, also for both countries, the greeting intensity. The line is the trendline with its confidence interval. On the x-Axis 1 means strongly disagree, 5 means strongly agree. On the y-Axis, 0 means low intensity, 1 means high intensity.



**Figure 9. Correlation between proximity to the owner and “Attachment of the dog”.** Shown is the correlation of the proximity to the owner and the “Attachment of the dog”. The lines are the trendlines with their confidence interval. On the x-Axis, 1 means strongly disagree, 5 means strongly agree. On the y-Axis, 0 means no time spent in proximity of the owner, 1 means the whole time in proximity of the owner.

**Table 6. Correlations Questionnaire and SST**

| <i>Correlation</i>                                             | <i>rho</i>  | <i>p-value</i>   | <i>p-value corr.</i> |
|----------------------------------------------------------------|-------------|------------------|----------------------|
| Attachment of the dog x Proximity to the door                  | 0.07        | 0.383            | 0.383                |
| Attachment of the dog x Proximity to the owner                 | <b>0.20</b> | <b>0.013</b>     | <b>0.038</b>         |
| Attachment of the dog x Following the owner                    | 0.15        | 0.055            | 0.110                |
| Attachment of the dog x Greeting intensity                     | <b>0.31</b> | <b>&lt;0.001</b> | <b>&lt;0.001</b>     |
| Attachment of the owner x Proximity to the door                | 0.07        | 0.394            | 1.183                |
| Attachment of the owner x Proximity to the owner               | 0.10        | 0.207            | 0.827                |
| Attachment of the owner x Following the owner                  | 0.02        | 0.772            | 0.772                |
| Attachment of the owner x Greeting intensity                   | 0.06        | 0.454            | 0.909                |
| Anthropomorphic attitude of the owner x Proximity to the door  | 0.02        | 0.830            | 0.830                |
| Anthropomorphic attitude of the owner x Proximity to the owner | 0.10        | 0.196            | 0.589                |
| Anthropomorphic attitude of the owner x Following the owner    | 0.06        | 0.498            | 0.995                |
| Anthropomorphic attitude of the owner x Greeting intensity     | 0.15        | 0.068            | 0.271                |

**Table 7. Correlations Questionnaire and SST in Austria**

| <i>Correlation</i>                                             | <i>rho</i>  | <i>p-value</i>   | <i>p-value corr.</i> |
|----------------------------------------------------------------|-------------|------------------|----------------------|
| Attachment of the dog x Proximity to the door                  | 0.16        | 0.155            | 0.310                |
| Attachment of the dog x Proximity to the owner                 | <b>0.38</b> | <b>&lt;0.001</b> | <b>0.003</b>         |
| Attachment of the dog x Following the owner                    | 0.15        | 0.190            | 0.190                |
| Attachment of the dog x Greeting intensity                     | 0.22        | 0.054            | 0.161                |
| Attachment of the owner x Proximity to the door                | 0.03        | 0.802            | 1.604                |
| Attachment of the owner x Proximity to the owner               | 0.12        | 0.300            | 1.200                |
| Attachment of the owner x Following the owner                  | 0.01        | 0.905            | 0.905                |
| Attachment of the owner x Greeting intensity                   | -0.09       | 0.442            | 1.327                |
| Anthropomorphic attitude of the owner x Proximity to the door  | 0.09        | 0.451            | 0.903                |
| Anthropomorphic attitude of the owner x Proximity to the owner | 0.16        | 0.167            | 0.500                |
| Anthropomorphic attitude of the owner x Following the owner    | 0.01        | 0.958            | 0.958                |
| Anthropomorphic attitude of the owner x Greeting intensity     | -0.25       | <b>0.030</b>     | 0.119                |

**Table 8. Correlations Questionnaire and SST in Hungary**

| <i>Correlation</i>                                             | <i>rho</i> | <i>p-value</i> | <i>p-value corr.</i> |
|----------------------------------------------------------------|------------|----------------|----------------------|
| Attachment of the dog x Proximity to the door                  | 0.03       | 0.793          | 0.793                |
| Attachment of the dog x Proximity to the owner                 | 0.11       | 0.332          | 0.996                |
| Attachment of the dog x Following the owner                    | 0.05       | 0.657          | 1.313                |
| Attachment of the dog x Greeting intensity                     | 0.20       | 0.086          | 0.345                |
| Attachment of the owner x Proximity to the door                | 0.12       | 0.311          | 0.933                |
| Attachment of the owner x Proximity to the owner               | 0.11       | 0.347          | 0.694                |
| Attachment of the owner x Following the owner                  | 0.01       | 0.950          | 0.950                |
| Attachment of the owner x Greeting intensity                   | 0.19       | 0.090          | 0.359                |
| Anthropomorphic attitude of the owner x Proximity to the door  | -0.02      | 0.858          | 1.716                |
| Anthropomorphic attitude of the owner x Proximity to the owner | 0.12       | 0.311          | 0.932                |

|                                                             |      |       |       |
|-------------------------------------------------------------|------|-------|-------|
| Anthropomorphic attitude of the owner x Following the owner | 0.02 | 0.875 | 0.875 |
| Anthropomorphic attitude of the owner x Greeting intensity  | 0.16 | 0.164 | 0.657 |

## Discussion

The aim of this study was to investigate if and how the cultural differences in Austrian and Hungarian cities and their suburban areas influence the attachment, the anthropomorphic attitudes of the owner and the attachment behaviour of the dog. Additionally, I examined whether there are correlations between the attitudes of the owner and the behaviour of the dog in the Strange Situation Test from Ainsworth. The results showed that Austrian dog owners did not significantly differ from Hungarian owners in their reason for buying their dog; in both countries, the question was more frequently answered with a functional reason. In the questionnaire about the dog-owner relationship Hungarian owners rated the section "Attachment of the dog" higher than the Austrian owner and they also had higher scores on the "Anthropomorphic attitudes of the owner". The rating of the "Attachment of the owner" was not significantly different between both countries, however all three sections were rated quite high in both countries. In the Ainsworth Strange Situation Test the Hungarian dogs followed the owner significantly more and also had higher greeting intensities than the Austrian dogs, though there was no difference in the time the dogs spent close to the owner when the owner was present and close to the door when the dogs were alone in the room. Dogs which were seen as more attached from their owners, were also more in close proximity of the owner and had higher greeting intensities. This effect was especially pronounced in the Austrian dogs.

My first hypothesis was based primarily on the results of Wan et al. (2009), where they found out that, compared to American dog owners, Hungarian dog owners were more likely to keep their dogs outside. I thought that owners which keep their dogs outside are also less attached and anthropomorph. Against my predictions, this was not the case.

On one hand, owners from Austria and Hungary answered the reason to have a dog, with no significant difference. In both countries, the question was more often answered with a functional reason than an emotional reason, which aligns with the results of Wan et al. (2009), where only 23% of the Hungarian owners answered the purpose of having a dog with "family member" or a similar term. In contrast, in the review study of Franklin (2007), in which they examined human-animal relationships in Australia using a national survey of 2000 people and case studies conducted between 2000 and 2004, he mentioned that 82% of the dogs owned in Australia were owned for companionship. However, the analysis of the motivation to get a dog was a bit tricky because some answers were ambiguous. One possibility to make this part a bit clearer could be to give owners answer possibilities to tick in future studies; this way, answers should be more distinct in differentiating between a loving motivation of getting a dog or a more functional motivation.

On the other hand, the sectors Attachment of the dog", "Attachment of the owner" and "Anthropomorphic attitudes of the owner" were not rated higher in Austria than in Hungary. While the "Attachment of the owner" was not significantly different between the countries, the Hungarian owners rated their dog's attachment higher and rated themselves as more anthropomorphic than Austrian owners. Hence, a cultural difference seems to be present in some of my parameters, but in the opposite direction as predicted. In the study by Szánthó et al. (2017) they investigated how owners

perceive their dog's emotional reaction on other humans and conspecifics emotional behaviour in Germany and Hungary. Hungarian owners of that study agreed more with the sentences "I have no problems with my dog at all; My dog thinks like a child; My dog means more to me than any human being", than German owners. Such statements align with my result that Hungarian owners have an anthropomorphic attitude towards their dogs, and that this attitude may differ from that of German and Austrian owners. In the cross-cultural study of Wan et al. (2009) between American and Hungarian German Shepherd owners, country was not a significant predictor on the score of the attachment of the owner, which is in line with the non-significant result of this parameter in the study presented here. One critical point in case of the questionnaire data is the reliability of the owner's responses, as biases are inherent in self-reported data. However, in the study of Turcsán et al. (2012) mentioned above, they used questionnaires to assess both human and dog personality. In their study, they tested the reliability of the owner's responses by having other household members fill out the questionnaire regarding the dog's personality as well. They showed that dog owners appear to have a good understanding of both their relationship with their dog and the dog's characteristics.

In both countries the three sections were rated quite high. In a study of Bekova and Makenov (2018) they analysed the dog-keeping practices in Russian urban areas. They differentiated between single-story areas with single-story buildings and multi-story areas with multi-story buildings. People of the multi-story areas called their dogs more often with an anthropomorphic word like family member than people of the single-story buildings. This aligns with my ratings in the section "Anthropomorphic attitudes of the owner" with owners living in urban areas, as those likely live in multi-story buildings.

Why did our results on the dogs' attachment and anthropomorphism go in the opposite direction as predicted? In the study showing differences between American and Hungarian owners (Wan et al. 2009), they did not mention of which area or city the owners came from, especially in Hungary. It is possible that mostly owners of rural areas participated in that study. In my study, even if I had no detailed data, the participants were mainly from the cities of Vienna and Budapest and their suburban areas. In urban areas, it is more common to keep the dog indoors, likely because it is quite expensive to live in a house with garden and not so many citizens can afford this. This means that the study of Wan et al. (2009) may be different to mine in case of where the owners of the Hungarian sample are from. Additionally, I based my hypothesis on the study of Fielding and Plumridge (2005), which mentioned that it is harder for dogs who live outside to form bonds with their owner. Indeed, this study was carried out at the Bahamas, which might not be comparable with Middle European keeping conditions.

My second hypothesis was that cultural differences in owner-dog relationships should be expressed in the Strange Situation Test (SST). Specifically, I predicted that the owners who saw their dogs as more attached and had a more anthropomorphic view had dogs which were more attached in the Strange Situation Test. Although the country effect was vice versa than expected (see above), the findings are in line with my predictions. The Hungarian owners see their dogs as more attached and are also more anthropomorphic than the Austrian owners, with the Hungarian dogs showing more attachment

behaviours in the Strange Situation Test than the Austrian dogs. Kovács et al. (2018) also found that Hungarian dogs showed more attachment than Austrian dogs. The sample of that study was very similar to mine, in case that the Austrian participants were recruited by two Universities in Vienna, the University of Veterinary Medicine Vienna and the Medical University of Vienna in Austria, and the Hungarian owners were recruited from the database of the same University, the Eötvös Loránd University in Budapest. This supports the fact that there are cultural differences in the attachment behaviour of dogs in Austrian and Hungarian urban areas. The study by Kovács et al. (2018) is particularly relevant regarding the issue of sample size, as the sample size in my study was not very large, and there is a potential risk of not detecting a pronounced effect in small samples (Szánthó et al., 2017), but as the study of Kovács et al. (2018) had nearly the same sample size, it should not be a limitation. Another study, which did not focus on attachment or anthropomorphism but examined the similarity of personality between dog owners and dogs, also found that there were more and stronger connections between the dog's personality and owner's personality in Hungary than in Austrian dogs and owners (Turcsán et al., 2012). This is another evidence that there are cultural differences between these two countries. The stronger personality matching of owner and dog in Hungary (Turcsán et al., 2012) may contribute to a stronger attachment and therefore this could be one explanation why the Hungarian dogs showed more attachment behaviours in my study. There exists evidence that the personality of the dog, more precisely how affectionate the dog is (affection in dogs describes how social, friendly and loving the dog is, equivalent to the personality characteristic agreeableness in humans), has an input on the development of a Separation Related Disorder (SRD) in German dogs but not in Hungarian dogs (Konok et al., 2015). The reason for this remains unclear and needs to be further investigated. However, this highlights again the existence of cultural differences.

In the mother-infant relationship of humans, the individual emotional reactions and the sensitivity towards the child's behaviours seem to influence the attachment bond (Ainsworth et al., 1978; Bretherton, 1992). Hence, it may be more important how the attachment figure reacts towards, in our case, the dog than how much time owner and dog actual spend together. Potentially, the quality of the interactions is more important than the quantity and maybe the Hungarian owners of my sample were more sensitive towards their dog's behaviour which led to a stronger attachment. Moreover, also in the study by Wan et al. (2009), the country was not a significant predictor of the amount of time owners spent with their dogs, despite the fact that American dog owners were more likely to keep their dogs indoors compared to Hungarian owners. It is therefore possible that Hungarian owners spend much time with their dogs in case of doing activities or going on walks together, which has a positive impact on the attachment bond (Dotson & Hyatt, 2008; Kobelt et al., 2003; Lee et al., 2022; Väättäjä et al., 2021), and might explain the observed differences between our samples from Budapest and Vienna. Note, however, that I had no data about the activities the owners did with their dogs and how much time they spent together. Future studies should aim for adding this (potentially) valuable information.

One issue regarding the results of the Strange Situation Test was that the attachment behaviours, in general, were not observed at a high percentage in any of the countries. This raises the question of why this was the case and what the outcome of the study might have been if attachment behaviours

had been observed at a higher percentage. Would this have led to a different result or to a more pronounced difference? Furthermore, the room size was not the same in the two countries. The room in Hungary was smaller than the room in Austria. Even though the proximity areas were adapted, it is possible that this had an effect on the coding. However, the proximity to the owner and to the door was not significantly different and I think the room size would affect rather the proximity areas than the line crossings (for evaluation of the following behaviour). Likewise, the greeting behaviour should hardly be influenced by the room size. Another point is that one must be careful with measuring the strength of an attachment behaviour, which was done in this study at least in case of the greeting intensity. A critical concept within attachment theory, as discussed by Ainsworth et al. (1978) and Cassidy (2008), is that the intensity of attachment behaviours (e.g., following the owner, proximity) does not always correlate directly with the strength of the attachment bond. This study showed that Hungarian dogs followed their owners more frequently and exhibited higher greeting intensity, but this does not necessarily indicate that their attachment bonds are stronger than those of Austrian dogs. Cassidy (2008) emphasizes that a securely attached individual may display fewer proximity-seeking behaviours, as their sense of security allows them to explore more independently.

Interestingly, when statistically correlating the ratings from the three sections of the questionnaire with the behaviour of the dogs in the Strange Situation Test a slightly different picture emerges. Without taking the country into account, only the "Attachment of the dog" was positively correlated with the proximity to the owner and the greeting intensity, what partially aligns with the predictions. To get a deeper understanding of the data, the same correlations had been done for Austria and Hungary separately, but the results did not differ much. Dogs from Austria which had high ratings in the "Attachment of the dog" were also more in proximity of the owner, whereas all other correlations were not significant, including all correlations from Hungary. This is quite interesting because without correlating the data, the Hungarian owners had a higher anthropomorphic attitude and rated their dogs as more attached, what is reflected by the data in the SST where the Hungarian dogs followed their owner more and had a higher greeting intensity. However, when statistically correlating the data, this effect was not present anymore. I think that the great mean variation of my variables could be the possible reason that the correlation was not statistically significant in the Hungarian dogs. The data revealed that the attachment of the dog, reported by the owner, had an input on the attachment behaviour in the SST, more precisely on the contact seeking behaviour, at least in Austria, although the correlation coefficients were not high, especially between the correlation of the attachment of the dog and the proximity to the owner. However, the attachment of the owner and the anthropomorphic attitudes did not correlate with the behaviour of the dog in the SST. The study of Rehn et al. (2014), where they investigated if there was a correlation how an owner perceives the relationship towards their dogs and how the dogs perceives the relationship, provided no evidence that the perceived strength of an owner's bond with their dog was reflected in the strength of the dog's bond with its owner too. In the study of Ryan et al. (2020), which was carried out in Canada and investigated the potential correlation between personality and dog-owner attachment in der SST, they also had no correlations between the attachment of the owner measured by DAQ (Dog Attachment Questionnaire

Scale, Archer & Ireland, 2011) and the dogs behaviour in the SST, similarly to my study. It is possible that there exists a bias innately in the data, because more highly engaged dog owners are interested to participate in such studies than average dog owners and that differences would rather appear in participants with lower attachment scores (Ryan et al., 2020; Smith et al., 2022; Wan et al., 2009). As already mentioned earlier, the mean attachment score of the owner in both countries was approximately 3.9 out of a maximum possible score of 5, which is quite high. An idea to motivate less engaged dog owners to participate in behavioural studies would be to provide some sort of benefit for them, such as a coupon for dog food or a small payment. Nevertheless, this innate bias is hard to avoid.

It is worth to point out that this study focused only on the attachment behaviours, although there is a strong connection between attachment and the concepts of the safe haven and the secure base effect, as mentioned in the introduction. The study conducted here used methods which are not well-suited to evaluate these two effects thoroughly. To investigate these effects, further modifying of the SST would have been required. Exploration behaviour is particularly important for the secure base effect; indeed, it is very sensitive to the order of the episodes. To address this problem, it is necessary to counterbalance the order of the episodes (Palmer & Custance, 2008; Prato-Previde et al., 2003). Furthermore, there is a specific problem with play behaviour. There are two episodes where the dog gets the chance to play, at first with the owner and in another episode later with the stranger, with the owner being absent. If the dog plays in both episodes, it is easy to interpret, similar when the dog plays with the owner and not with the stranger (Palmer & Custance, 2008; Prato-Previde et al., 2003). Playing with the owner but not with the stranger can be a result of an activated attachment system where the dog shows separation anxiety and therefore can be analysed as a value for attachment (Ainsworth et al., 1978; Topál et al., 1998). However, when the dog plays with none of them, there are at least two interpretations: on one side, it could be that the dog does not like to play at all; on the other side, it could be that the dog is not attached enough to the owner and therefore does not play. To avoid this ambiguity, I did not take the play behaviour into account. Furthermore, other findings revealed that even if the dogs showed attachment behaviours in the SST, they did not differ in play behaviour in the presence of the owner or the stranger (Gácsi et al., 2001).

To summarize, this study shows that there are cultural differences in the attachment bond between dogs and their owners in two European countries. However, the effect was contrary to what was initially expected, with Hungarian dogs and owners showing a stronger attachment than their Austrian counterparts. This finding provides valuable insights into the complexity of the human-animal bond, demonstrating that attachment is not only influenced by individual factors but also by cultural contexts. This study highlights the multifaceted nature of attachment, suggesting that various factors, such as anthropomorphic attitudes, the dog-owner relationship, and even the personality traits of both the dog and owner, can significantly influence the attachment bond. As a result, further research is needed to better understand how cultural and individual factors interact in shaping the attachment between owners and their dogs. It is also important to note that the study was limited by its information about the participants' living environments and daily activities with their dogs. In future studies, collecting

more detailed data on these variables would help provide a clearer understanding of how attachment bonds are formed and what factors may play a role in cross-cultural differences. Additional research comparing more countries or cities, especially those that share similar cultural backgrounds, would also shed light on whether these findings can be generalized to other regions and help build a more robust framework for understanding human-animal attachment across different cultural contexts.

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