Dog Behavior, 1-2021, pp. 19-34 • DOI 10.4454/db.v7i1.133

A new perspective on the bond between human beings and animals: A study on the human-dog and human-horse relationship

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Abstract: The aim of this study was to investigate whether and to what extent human attachment theory explains the bond between humans and animals. We examined whether the five main dimensions, outlined by Bowlby also exist in human-dog and human-horse relationships. A sample of 592 Italian adult dog and/or horse owners were tested using the Reciprocal Attachment Questionnaire (RAQ) to analyze their intra-specific relationships, while two adapted versions of the RAQ were used to investigate human-dog (RAQ-HD) and human-horse (RAQ-HH) bonds. The results indicate that the construct of the human-dog and human-horse relationship appears to be based only on three of the five main dimensions of Bowlby's attachment theory: namely, proximity seeking, separation protest and feared loss. These findings suggest that the bond between adult humans and animals, although long-lasting, intense and psychologically and emotionally important, can be viewed as a bond of affection and not as a real attachment bond.

Key Words: attachment bond, human, dog, horse, animal, mental representations.

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Introduction

Many people choose to share their lives with a pet and several studies have investigated the reasons leading to this choice and particularly the type of psychological bond that people establish with their pets (Anderson, 2008). The literature on the human-animal relationship clearly shows that some pet owners have a strong feeling of affection towards their animals and generally consider and treat them as true members of the family (Katcher et al., 1983; Burnham et al., 2002; Walsh, 2009). Indeed, pets, especially dogs and cats, can be perceived as a source of comfort in situations of emotional stress (Kurdek, 2009) and most owners experience painful long-lasting feelings of grief and discomfort when their pets die, maintaining with them ongoing and meaningful ties even following their death (Davis, 2011; Testoni et al., 2017). It seems that there are clear parallels between the kind of reactions that people exhibit to the loss of a pet and the loss of a meaningful human relationship (McCutcheon & Fleming, 2001; Field et al., 2009).

The relationship with animals can be considered as an inter-personal relationship; therefore, behaviors, actions and beliefs are influenced by the mental representations that people have of these relationships (Zilcha-Mano et al., 2011). Animal owners dedicate time and money to guarantee physical and psychological well-being to their pets and different theories have attempted to explain the benefits of this relationship: the theory of biophilia, the theory of social support and the attachment theory. According to the theory of biophilia, humans tend to establish relationships with animals because they are useful for survival. Animals can warn humans of possible dangers and/or predators; however, in an industrial context like the one we

Submitted, 07/02/2021
Accepted, 07/27/2021

live in nowadays, this characteristic is less relevant and poorly applicable. For this reason, it is legitimate to think that the benefit of this relationship is also attributable to other aspects that go beyond physical survival. In relation to the theory of social support, companion animals tend to reduce the feeling of loneliness and contribute to a general sense of well-being in their owners (Sable, 1995). The relationship with pets, unlike the one with humans, offers social support because pets offer constant availability, unconditional love and a relationship that is non-judgmental (Friedmann et al., 1980; Kruger et al., 2004). Pets not only have a direct role in providing social support but also an indirect role in favoring a general well-being in their owners. Moreover, animals can help in catalyzing certain dimensions of socialization: getting to know people, forming friendship and creating social support networks (Wood et al., 2015).

Finally, several studies, investigating the biological and psychological bases of the human-animal relationship, have considered Bowlby's Attachment Theory (Bowlby 1982, 1983) as a useful framework to explain the emotional and relational complexity of the inter-specific bond between humans and animals and, in particular, the human-dog relationship (Julius et al., 2010; Zilcha-Mano et al., 2011; Cromer & Barlow, 2013).

Besides being considered members of the family, pets are often viewed and treated like children in many aspects: pet owners play with them (Smith, 1983), hold and cuddle them (Serpell, 1986) and also talk to them using baby-talk (Hirsh-Pasek & Treiman 1982; Berryman, 1985; Beebe & Lachmann, 2003, 2015; Prato-Previde et al., 2006), a type of adult-child verbal communication characterized by simplicity (usually only verbs and adverbs) and by a strong non-verbal and emotional component (Schore, 2008). Ellen Noonan has suggested in her work "People and Pets" (Noonan, 2008) that pets can act as attachment figures, transitional objects and even therapists. She questioned whether it was the human being or the animal to turn to the other in moments of need, which one of the two provided comfort, protection and stood as a secure base, promoting exploration. Her studies revealed that the human-pet relationship was reciprocal in that the owner was a figure of attachment to the animal and vice versa. Likewise, Julius et al. (2014) suggested that the human-animal bond is a reciprocal relationship in which, depending on the situation, either the pet or the owner can be a source of comfort and caregiving. This flexible relationship is considered as a core element of the biopsychosocial benefits that humans obtain from a relationship with animals (Julius et al., 2014). Pets act for their owners as mediators in their relationship with the world and they may serve the same roles of traditional transitional objects for children (Triebenbacher, 1998), although they cannot be a real transitional object because they are living and sentient beings.

The literature on the human-animal relationship suggests that the inter-specific human-animal bond is characterized by four specific components of the attachment bond: search for proximity, safe haven, safe base (or secure base) and separation distress (Zilcha-Mano et al., 2011; Prato-Previde & Valsecchi, 2014; Payne et al., 2016).

Several studies have investigated whether the close and individualized relationship between an animal species (i.e. chimpanzees, cats, dogs) and a human partner conforms to an attachment bond using adapted versions of the Strange Situation Test (Ainsworth, 1978), devised to investigate the mother-infant relationship (e.g. Bard, 1991; Topal et al., 1998; Prato Previde et al., 2003; Edwards et al., 2007). Most of these studies have been carried out on dogs and have shown that the human-dog bond conforms to an infant-like attachment (Prato-Previde & Valsecchi, 2014). In particular, it has been shown that dogs engage in behaviors, which are indicative of a form of attachment that is present in human caregiver–infant relationships, namely proximity seeking, protest and separation-related distress, the safe haven effect and secure base effect (Prato-Previde et al., 2003; Gácsi et al., 2011; Horn et al., 2013).

The bond between man and animal has been investigated mainly through questionnaires and scales in which the behavioral component of the strange situation is measured by drawing on its adult psychological equivalent, although not necessarily on the basis of the theory of hu-

man attachment (Albert & Bulcroft 1988; Johnson et al., 1992; Beck & Madresh, 2008). However, the means used in these studies does not really return a psychometric validation of the theoretical construct.

The purpose of our study was not to validate a new scale but rather to investigate if the theory behind the human-animal bond may be explained by the 4 typical dimensions present in the infant-like attachment, if the dimensions are more, i.e. 5, as happens in the adult attachment according to West (West et al., 1987; West, 1994), or, at the opposite, if the dimensions are less.

For example, validated psychological tests were used by Konok and colleagues (2015) to support behavioural data on the human-dog relationship. More specifically, the authors (Konok et al., 2015), employed the Adult Attachment Scale (Collins, 1990; Main, 1991; Main et al., 2005) to capture the core structure, determining the attachment style, the Big Five Inventory (John & Srivastava, 1999) to describe the main personality traits of the owner and, in addition, they developed a Dog Big five Inventory to assess dogs' personality traits.

Finally, a number of studies have shown that, other than psychological aspects, also biological aspects should be taken into account in the human-animal relationship (and in particular the human-dog relationship). For example, oxytocin seems to play a central role in the human-animal bond, as has been demonstrated in mother-infant relationships and romantic relationships (Odendaal & Meintjes, 2003; Miller et al., 2009; Handlin et al., 2011, 2012). Oxytocin can be released after visual and/or physical contact with others (either conspecifics or non-conspecifics) and there is evidence of a correlation between the oxytocin system, the stress system and the attachment-care systems throughout the lifespan of an individual (Schneiderman et al., 2012; Ogi et al., 2020). According to Bowlby (1988) the concept of attachment is not only important during infancy but also throughout the entire life of an individual. In fact, it has recently been claimed that attachment bonds fulfil the same functions across the life span of a person (Hazan & Shaver, 1987), being equally important also in adult relationships. In romantic relationships, even as adults, we show towards the partner proximity seeking and maintenance, separation distress, seeking comfort from him/her in times of stress (safe haven), and deriving from him/her a sense of security (secure base) (Mikulincer & Shaver, 2003; Doherty & Feeney, 2004; Zilcha-Mano et al., 2011). Studies, which have extended the human attachment framework in order to analyze the relationship between attachment to pets (mainly dogs and cats) and attachment to people, have provided an initial evidence of the usefulness of the measures of attachment as tools for the investigation of people's relationship of affection with their pets (Beck & Madresh, 2008; Smolkovic et al., 2012). The style of attachment to humans and the one to animals appear to be independent from each other; there seems to be no transfer of the human attachment style to animals (Beck & Madresh, 2008; Julius et al., 2010).

We decided to investigate on the human-dog and human-horse bonds considering the lack of scientific literature on the mental representations of the human-horse or human-dog bonds, the evolutionary and domestication histories of these two species, as well as their current daily management in human societies (Payne et al., 2016). Both dogs and horses live and interact with humans and both species are kept for specific working purposes and/or as pets. However, dogs have a more central role as human companions than horses and generally they share their life with us to a greater extent. In addition, both species are social, and there is evidence that they form social relationships with conspecifics and humans (Malavasi & Huber, 2016; Fugazza, et al., 2018). Indeed, they both play a different but important role in promoting human health and well-being and are considered the most suitable animals in Animal-Assisted Intervention (American Veterinary Association, 2014; Guidelines of Italian Ministry of Health, 2015). Nevertheless, these two species also differ in their evolution and domestication histories: dogs are predators whereas horses are prey. Therefore, it has been suggested that these two species may possibly differ in their propensity to form attachment or attachment-like relationships with

humans. Payne and co-workers (2016) outlined there is ample evidence for the existence of human-dog attachment (e.g. Prato-Previde & Valsecchi, 2014), whereas the evidence for human-horse attachment is almost negligible (DeAraugo et al., 2014). They also suggested that this difference might depend on the different selection paths of domestic dogs and horses as well as the different contexts in which the two species interact with humans and the contrasting roles these animals occupy in human domains.

Another reason for choosing and comparing these two species in the current study is the different management and living environments of the horse and the dog. In the Italian context horses often stay in stables, while dogs live in homes with their owners. In the literature there are no studies on the impact that the different way of looking after the dog and the horse may have on the attachment bond; however, the differences in intimacy with humans could affect attachment. Therefore, in the present study the theory was investigated separately for dog and horse.

The current study, thus, investigated whether and to what extent the attachment theory developed for human intra-specific relationships could explain the inter-specific bond between humans and animals. More specifically, our aim was to evaluate the mental representations that people have of the bond with their animals and to assess whether the five main dimensions, characterizing the attachment bond (i.e. proximity seeking, separation protest, feared loss, perceived availability, use of the attachment figure) according to West and Sheldon-Keller (West & Sheldon-Keller, 1992), can also be attributed to the human-dog and human–horse inter-specific relationship.

We considered the five dimensions of attachment, instead of four, as we applied the Reciprocal Attachment Questionnaire (RAQ), constructed and validated in English by West (West et al., 1987; West, 1994). We relied on this means because we considered it as the most suitable tool for our study although aware of the fact of it not being totally adherent to the human-animal attachment theory but validated unlike other scales. Our final aim was to study if there was a difference in the human-dog and human-horse bond assuming that the difference between species and the different way in which dog and horse are managed could influence this link.

Materials and methods

Participants and procedure

The study population consisted of 592 adults (177 males and 415 females), aged between 18 and 78 years old (mean = 34.41 years; SD = 13.41), who participated to the four-day sports event Fiera Cavalli 2018, which was held in Verona (Italy) from 25th to 28th October 2018. The setting did not allow to calculate the response rate and participation to the survey was voluntary and anonymous.

Eight research assistants, who had been previously trained, directly contacted all participants and each research assistant approached a person at random. The research assistants explained the survey to the participants and assisted in the compilation of the self-report questionnaire if they claimed to be owners of at least one dog and/or one horse. Participants were told that the purpose of the study was to gain knowledge concerning the human-dog and/or human-horse relationship and that their responses would remain anonymous and would be used for scientific research alone. Research assistants had received a specific training and questions were addressed following a precise protocol: in case a participant did not understand a question and asked for help, the question was rephrased by the assistant in a different but standardized way to avoid personal reformulations. Each research assistant further verified the correct compilation upon completion of the questionnaire. Only respondents that completed the questionnaire were considered for statistical analyses.

Experimental setting

The test was administered in the main stand of the Federazione Italiana Sport Equestri (FISE) at the Fiera Cavalli 2018, in Verona (Italy), by research assistants with a specific training in the psychological field (Bachelor or Master's degree in Psychology) and trained by the research team in addressing the questions and in the compilation of the questionnaire. The test administration took place during two of the four opening days of the event (26th-27th October). Respondents were informed about the privacy and anonymity of the participation according to the National Privacy Law 675/96. Formal ethical approval was not requested but the study was carried out according to the indications of the declaration of Helsinki.

No personal sensitive data were asked. The questionnaire's aim to assess the attachment of the participants towards pets was not explicitly mentioned to avoid the social desirability bias. For the same reason, participants were told that there were no right or wrong answers, as the focus was on their authentic point of view. After completing the questionnaire, participants were fully debriefed on the purpose of the study.

Measurement tools

Following a preliminary analysis of the literature on the human-animal bond, we identified two types of psychological scales: scales created for measuring inter-specific attachment to pets (i.e. Pet Attachment Questionnaire – PAQ: Zilcha-Mano et al., 2011; Lexington Attachment to Pets Scale – LAPS: Johnson et al., 1996) and scales created for measuring intra-specific attachment between humans in adulthood (e.g. self-report measure, Attachment Style Questionnaire – ASQ: Feeney et al., 1994; 15 Item Questionnaire – 15IQ: Mikulincer et al., 1990; or interview, i.e. Adult Attachment Interview – AAI: George et al., 1985; Current Relationship Interview – CRI: Crowell and Owens, 1996). The inter-specific attachment scales (human-pet) were excluded from our research due to the poor methodological framework used in their construction and for the lack of adequate general psychometric properties. Moreover, some intra-specific attachment scales were not utilized since they were specific to intimate relationships and sexual factors when analyzing the pattern of attachment. In addition, unfortunately, only a few of the intra-specific and none of the inter-specific attachment scales were validated in the Italian population.

Thus, the only instrument, satisfying our research requirements, was the Reciprocal Attachment Questionnaire (RAQ). The RAQ scale is based on the attachment theory, which takes into consideration the different features of attachment (proximity seeking, separation protest, feared loss, perceived availability and use of the attachment figure). It was originally developed to evaluate an adult's pattern of attachment to a significant other being with whom the individual had shared a special relationship for at least 6 months. We chose the RAQ scale as a basis to create two different adapted versions of the measurement tool to analyze the human-animal bond: namely, the Reciprocal Attachment Questionnaire Human-Dog (RAQ-HD) and the Reciprocal Attachment Questionnaire Human-Horse (RAQ-HH). We chose to use the RAQ scale as it assesses the quality of attachment towards anyone, who is identified as the most important attachment figure for the subject (e.g. a partner, a friend, etc.) and also because its validity and reliability have been established in different studies on both clinical and nonclinical adult populations (West & Sheldon-Keller, 1994; Perris & Andersson, 2000; Ward, et al., 2000). The Reciprocal Attachment Questionnaire (RAQ) is a self-report questionnaire, constructed and validated by West (West et al., 1987; West, 1994), and designed to measure attachment towards the main human attachment figure. The complete version of the RAQ scale consists of 45 items and each item is rated using a 5-point Likert-type scale, ranging from strongly agree to strongly disagree. Items are grouped into different subscales to assess both clinical and nonclinical aspects of human attachment (West & Sheldon-Keller, 1992). In particular, three of the subscales

describe the criteria of attachment distinguishing it from other social relationships (i.e. Separation Protest, Feared Loss, and Proximity Seeking), while the other two subscales (i.e. Use and perceived Availability of the attachment figure) are related to the unique provisions provided by attachment. The remaining subscales describe identified dysfunctional patterns of adult attachment relationships (i.e. Compulsive Self-Reliance, Compulsive Care-Giving, Compulsive Care-Seeking, and Angry Withdrawal).

The RAQ scale has a short version, which consists of 15 items referring to the 5 dimensions of attachment: 1. Proximity seeking with the attachment figure, 2. Separation protest, 3. Feared loss, 4. Perceived availability and, 5. Use of the attachment figure. Each dimension is measured by 3 items on a 5-point Likert-type scale (strongly agree: score=1; strongly disagree: score=5).

The original English version of the short RAQ scale was translated into Italian by Busonera and co-workers (2011) and was used in the current research as a basis to create the adapted versions of the Reciprocal Attachment Questionnaires (RAQ-HD and RAQ-HH). We obtained permission to apply the Italian short RAQ scale in the present study directly from the authors of the translated test.

The final questionnaire, which was presented to the participants in the study, included a few preliminary socio-demographic questions (i.e. age, gender, marital status, education, occupation, presence of children) with the purpose of gaining background information on the participants themselves that could be relevant to their responses. In addition, it contained the original RAQ scale (intra-specific human-human), and the adapted versions RAQ-HD (inter-specific human-dog) and RAQ-HH (inter-specific human-horse).

Statistics analysis

Descriptive statistics (frequency distributions, central trend and variability indicators) were used to analyse the participant's characteristics (age, gender, study title, occupation, marital status, presence of children and the scores in the RAQ scale), especially in relation to owning a dog, a horse or both. These three groups of participants were compared in order to evaluate the homogeneity of the examined characteristics: the non-parametric test *Chi-square* was used for the categorical variables (gender, study title, occupation, marital status, presence of children), while Kruskal-Wallis and Mann-Whitney tests were applied for numerical variables (age and the scores at the RAQ scale), since the null hypothesis of normal distribution for these measures was rejected according to the Kolmogorov-Smirnov test.

Exploratory factor analysis was used to test the factorial structure of the version of the RAQ scale adapted to the human-dog and human-horse relationships. The sample size was established according to the rule of thumb that sets adequate numerosity at 300 participants when the participants/items ratio is also between 5 and 10. The violation of normality suggested the application of the principal axis method of factor extraction. The number of factors to be extracted was determined using the scree plot analysis, together to the criterion involving the extraction of factors showing an eigenvalue greater than 1. The extracted factors were rotated according to the Oblimin method since we assumed the correlation between the factors. The value of the sample size adequacy was examined by the KMO index and the sphericity hypothesis of the correlation matrix was verified by the Bartlett Test. The reliability of the extracted factors was assessed by Cronbach's alpha, taking into account that this index is influenced by the items numerosity and that its interpretation is quite controversial (Bland and Altman, 1997; Tavakol and Dennick, 2011): values between 0.7 and 0.95 are acceptable to assess for the internal consistency of a group of items, while higher values highlight the presence of redundant items. The significance level was set at $p<0.05$ and the analyses were performed with the SPSS-IBM v.23 software.

Results

The characteristics of the three groups (dog owners, horse owners, and both dog and horse owners) are illustrated in Table 1. The characteristics showed to be homogeneous within the three groups. None of the tests rejected the null hypothesis, except for the variable gender: in this case men seemed to be more prone to own a dog (36.6%), while women were more likely to own both a dog and a horse (75.8%), or only a horse (72.3%), and the difference between genders was significant (p=0.012; refer to Table 1 for details).

Table 1. Comparison between the characteristics of dog owners, horse owners and both dog and horse owners; absolute frequencies and relative frequencies (%) are indicated for categorical variables, while means±standard deviation for numerical variables.

		Dog owners (n=232)	Horse owners (n=137)	Dog and horse owners (n=223)	Statistics	P
Gender	*M*	85 (36.6)	38 (27.7)	54 (24.2)	Chi-square(2) = 8.769	***0.012***
	F	147 (63.4)	99 (72.3)	169 (75.8)		
Age		34.72±13.451	34.18±13.446	33.79±13.339	KW** $H_{(2)}$ = 0.744	0,689
Qualification	*First or second degree*	43 (18.5)	23 (16.8)	27 (12.1)	Chi-square(4) = 4.302	0.367
	Diploma	132 (56.9)	75 (54.7)	136 (61.0)		
	Graduation or other titles	57 (24.6)	39 (28.5)	60 (26.9)		
Profession	*Student*	47 (20.3)	34 (24.8)	56 (25.1)	Chi-square(6) = 7.474	0.279
	Worker	151 (65.1)	93 (67.9)	139 (62.3)		
	Unemployed/housewife/retired	27 (11.6)	7 (5.1)	25 (11.2)		
	Other	7 (3.0)	3 (2.2)	3 (1.3)		
Marital status	*Single*	71 (30.6)	45 (32.8)	65 (29.1)	Chi-square(6) = 0.772	0.993
	In pairs/cohabitant	88 (37.9)	50 (36.5)	89 (39.9)		
	Married	62 (26.7)	35 (25.5)	59 (26.5)		
	Other	11 (4.7)	7 (5.1)	10 (4.5)		
Presence of children	*Yes*	70 (30.2)	34 (24.8)	69 (30.9)	Chi-square(2) = 1.705	0.426
	No	162 (69.8)	103 (75.2)	154 (69.1)		
RAQ Points	*Human-dog*	53.89±10.28		54.58±9.43	MW* U = 25.366,500	0.661
	Human-horse		55.13±12.38	55.99±11.44	MW* U = 14.729,500	0.600

*: Mann-Whitney test; **: Kruskal-Wallis test.

The scree plots (Figure 1 and Figure 2), resulting from the factorial analysis made with the RAQ scale human-dog (RAQ-HD) and human-horse (RAQ-HH), showed a completely overlapping factorial structure. When looking at the two criteria (i.e. eigenvalues greater than 1 and variation of the slope of the curve), the number of useful dimensions explaining the factorial structure of the scales appeared to be equals to 3, as previously indicated (Figure 1 and Figure 2).

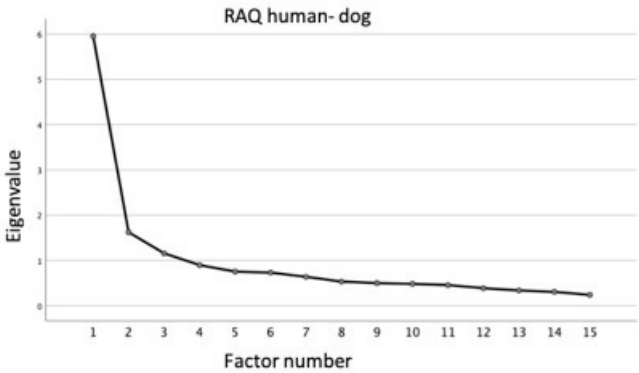

Figure 1. Scree plot of factor analysis: assessment of the human-dog attachment (RAQ-HD).

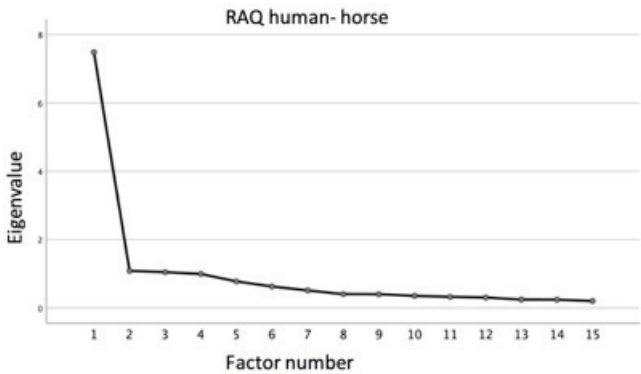

Figure 2. Scree plot of factor analysis: assessment of the human-horse attachment (RAQ-HH).

The two exploratory factor analyses showed an adequate sample size (RAQ-HD: KMO=0.898; RAQ-HH: KMO=0.928) and non-spherical covariance matrices (RAQ-HD: $p<0.000$; RAQ-HH: $p<0.000$). The structure matrix and the distribution of the items related to each factor are described in Table 2 and Table 3. In both scales, the first factor was the one collecting the largest number of items (10), while the other two dimensions, containing only two items, showed an insufficient number of items to provide an adequate description of the construct below. In addition, one of the scale's items ("I'm not in trouble if I walk away for a few days from my dog/horse") did not fit well in any of the extracted factors from the RAQ-HD or RAQ-HH's scale. Therefore, it was not placed in any of the factors as its factorial score was less than 0.3 (details are given in Table 2 and Table 3). The factorial structure of the two scales resulted almost completely overlapping: 8 of 10 items that were descriptive of the first factor of the RAQ-HD scale were also found in the first factor of the corresponding RAQ-HH scale. Interestingly, the items of the third factor of the RAQ-HD scale were the same to those corresponding to the second factor of the RAQ-HH scale.

The factor structure describing the psychological attachment construct between humans and animals did not seem to follow the traditional attachment theory between humans, although the three factors identified gave a glimpse of their specificity with a meaning that remains unclear. For example, as shown in the structure matrix of RAQ-HD (Table 2), an important level of cross loading was revealed between the items of factor 1 and the items of factor 3, highlighting the confusion regarding the definition of the items: this occurs when the informational content is not correctly identified by the respondents of the questionnaire. Likewise, even more elevated and widespread cross loadings were noticed in the RAQ-HH scale (Table 3).

Table. 2. Structure matrix of the factor analysis on the human-dog RAQ scale (RAQ-HD); extraction method: principal axis factoring; rotation method: oblimin; Factorial scores below 0.300 were omitted.

	Factor		
	1	2	3
I turn to my dog when I am in serious trouble	0.808		0.317
I feel lost and worried if my dog is not near me	0.741		0.559
When I'm anxious, I desperately need to stand next to my dog	0.737		0.413
When I'm upset, I need to have my dog close	0.728	0.338	0.543
I talk about things and I'm confident with my dog	0.721		0.422
When I'm upset, I'm sure my dog is there to listen to me	0.66	0.433	0.469
I feel sad when I spend time away from my dog	0.585		0.501
If I walk away for a few days from my dog I feel to have abandoned it	0.555		0.555
I address my dog for many things, including comfort and reassurance	0.548	0.4	0.345
I'm afraid I can lose my dog's love	0.486		0.372
I'm sure my dog will love me forever	0.322	0.589	0.406
I'm sure my dog perceives my mood	0.303	0.55	0.311
I feel scared to think that my dog can die	0.467		0.732
It saddens me to think that my dog will die	0.38	0.353	0.732
I'm not in trouble if I walk away for a few days from my dog			

Table 3. Structure matrix of the factor analysis on the human-horse RAQ scale (RAQ-HH); extraction method: principal axis factoring; rotation method: oblimin; Factorial scores below 0.300 were omitted.

	Factor		
	1	2	3
When I'm upset, I'm sure my horse is there to listen to me	0.847	0.56	0.399
I turn to my horse when I am in serious trouble	0.822	0.501	0.488
When I'm upset, I need to have my horse close	0.822	0.506	0.458
I address my horse for many things, including comfort and reassurance	0.808	0.468	0.349
When I'm anxious, I desperately need to stand next to my horse	0.795	0.5	0.579
I talk about things and I'm confident with my horse	0.761	0.532	0.538
I'm sure my horse will love me forever	0.666	0.518	0.309
If I walk away for a few days from my horse I feel to have abandoned it	0.647	0.48	0.605
I feel sad when I spend time away from my horse	0.643	0.496	0.399
I'm sure my horse perceives my mood	0.476	0.427	
I feel scared to think that my horse can die	0.586	0.832	0.334
It saddens me to think that my horse will die	0.512	0.815	
I feel lost and worried if my horse is not near me	0.654	0.488	0.844
I'm afraid I can lose my horse's love	0.453	0.391	0.612
I'm not in trouble if I walk away for a few days from my horse			

The reliability analysis of the extracted factors showed heterogeneous findings. Very high values of Cronbach's alpha were found for the first factor in both scales (RAQ-HD: α=0.880; RAQ-HH: α=0.920), although scale implementation strategies could be used. In the dog scale, the reliability value was increased by removing the item "I'm afraid I can lose my dog's love", while in the horse scale, Cronbach's alpha could be increased by removing the item "I'm sure my horse perceives my moods". Regarding the other dimensions, the second factor of the RAQ-HD scale showed a Cronbach's alpha of α=0.597, while the same factor of the RAQ-HH scale highlighted a value of α=0.814. Lastly, Cronbach's alpha of the third factor was similar for the dog scale (0.760) and the horse scale (0.721).

As already said, reliability measures showed heterogeneity between the factors. The lowest reliability values were recorded for factors with a low number of items, as the value of Cronbach's alpha is directly influenced by the number of items describing the factor. Nevertheless, the acceptable reliability values obtained from a small number of items, allowed to hypothesize the

possibility that these items could be the first building blocks to be used for a better description of the construct, which was the aim of the current study.

Discussion

The aim of this study was to investigate whether the attachment theory, developed to explain intra-specific human relationships, could provide an explanation for the inter-specific human-animal bond as well. In addition, possible differences between the human-dog and the human-horse bond were also examined. More specifically, we investigated whether the five main dimensions characterizing the attachment bond, as outlined by Bowlby (i.e. proximity seeking, separation protest, feared loss, perceived availability, use of the attachment figure), also existed in the human-dog and human-horse relationships. Two adapted versions of The RAQ scale (Bonera et al., 2011) were used to assess the human-dog (RAQ-HD) and human-horse (RAQ-HH) bonds, respectively.

The factor analyses revealed interesting differences between the human-human relationship and the inter-specific human-dog and human-horse bonds. Indeed, a three-factors structure was revealed by the exploratory factor analysis of the RAQ-HD and RAQ-HH scale rather than the five-factors structure known in the RAQ scale describing adult human attachment (West, 1994). As shown by the structure matrix of the factor analysis of the human-dog RAQ and the human-horse RAQ, both dog and horse owners appeared to search proximity to their animal, mainly in case of difficulty or distress. Moreover, the fear of the loss of the animal, such as in case of death of the animal but also in the case of a temporary separation, led the owners to negative thoughts and to behaviours aimed at seeking contact to their animal or at limiting the separation with it. The results, thus, obtained do not contradict the validity of the 5 dimensions recognized in the adult attachment but simply suggest they are not valid in the human-animal attachment.

Overall, our results indicate that the inter-specific bond with animals, specifically with dogs and horses, appears to be characterized by the dimensions "proximity maintenance", "separation protest" and "fear of loss", and, in contrast to other studies, not by the dimensions of "perceived availability" and "use" (Kurdek, 2008). This appears to be consistent with the fact that, as opposed to a human reference figure, an animal cannot engage in operative and concrete behaviours to solve problematic or difficult situations. However, it is worth noting that an animal can provide comfort and reassurance in case of difficulty or stress: Kurdek (2009) reported that owners turn to their pet dogs in times of emotional distress and prefer turning to their dog rather than to other figures of reference. Thus, additional studies are needed to further investigate the impact of individual differences on human-animal bonds and to better understand the role played by variables related to both the owner (i.e. age, gender, marital status etc.) and the dog.

Considering the informative content expressed by the dimensions identified by the RAQ scale, the interpretation of the first factor suggests the possibility of the hypothesis of an almost "pathological" bond with the animal: the items that were lumped together expressed a situation of individual feelings of discomfort or disturbance, associated with the use of affection or closeness of the dog/horse as the preferred solution. A factor (second and third factor in the human-horse and human-dog relationship, respectively), describing negative thoughts concerning the death of the animal, was also identified by the analysis; finally, the third factor, although not having the same representation in the two scales (human-dog, human-horse), expressed a sense of detachment from the animal and a sense of lacking due to the animal's absence.

Another interesting finding, which emerged in the study, was the lack of significant differences between the human-dog and human-horse bonding. This finding deserves further investigation as the literature on the human-horse and horse-human bond is still very limited compared to that regarding the human-dog and dog-human relationship. It has been suggested that due to

the different domestication and selection histories of dogs and horses and the different contexts in which they live and interact with humans, some differences in the propensity to form reciprocal attachment or attachment-like relationships would be detectable (e.g. Payne, 2016).

To summarise, the results suggest that the theory of human intra-specific attachment does not explain appropriately the inter-specific human-dog and human-horse bonds, which, instead, seem rather to have their own form, peculiarities and dimensions. Adult humans form their intra-specific relationships on the basis of their relational experiences from childhood and of the internal operative models learned from the relationship with their significant reference figures. Therefore, it is probable that also the inter-specific human-dog and human-horse bonds in adulthood are influenced by the person's internal operative models and by the style of attachment, though still with the assumption of a proper configuration.

A limitation of our study was attributable to the use of a scale that, although widespread in Italian contexts (Bonera et al., 2011), has not undergone a rigorous process of adaptation and validation elsewhere. Furthermore, although only a few aspects of the original scale were modified (for example the substitution of the term "person" with "dog/horse") to adapt the RAQ scale to the study of an inter-specific bond, the effect (and consequences) of this adaptation have yet to be investigated and should be further examined.

Conclusions

This study is a further step in the investigation and measurement of the human-animal inter-specific bond and provides a potentially useful tool to verify existing theories.

Our findings suggest that, as already demonstrated in other studies, the bond between humans and dogs/horses is a strong and meaningful affective bond, but it does not conform to a real attachment bond that meets the requirements, as identified by Bowlby (Bowlby, 1982 and 1983; Ainsworth, 1989). However, it is worth mentioning that the psychopathological variable was not evaluated in the current work: we assumed the participants to be healthy, although it might be interesting to investigate the effect of this variable in future studies.

Moreover, the use of the adapted versions of the RAQ scale (RAQ-HD, RAQ-HH) in the current study has provided data to work on the validation process in the Italian population of a new instrument devised to investigate the inter-specific bonds with both horses and dogs: namely the Reciprocal Human And Animal Questionnaire scale (RHAAQ).

Thus, although promising, the results of the present work highlight the need for further research on this topic and, in particular, on the bond between human beings and pets, and especially on the bond established between humans and dogs and humans and horses.

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Una nuova prospettiva sul legame tra uomo e animale: uno studio sul rapporto uomo-cane e uomo-cavallo

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Sintesi

Lo scopo di questo studio è stato quello di indagare se e in che misura la teoria dell'attaccamento umano spieghi il legame tra uomo e animale. A tal fine si è verificato se le cinque dimensioni principali, delineate da Bowlby, esistano anche nelle relazioni uomo-cane e uomo-cavallo. Un campione di 592 proprietari italiani di cani e/o cavalli adulti è stato testato utilizzando il Reciprocal Attachment Questionnaire (RAQ) per analizzare le loro relazioni intra-specifiche, mentre due versioni adattate del RAQ sono state utilizzate per indagare il legame uomo-cane (RAQ-HD) e uomo-cavallo (RAQ-HH).

I risultati indicano che il costrutto della relazione uomo-cane e uomo-cavallo sembra essere basato solo su tre delle cinque dimensioni principali della teoria dell'attaccamento di Bowlby: vale a dire, ricerca di prossimità, protesta per la separazione e timore della perdita. Questi risultati suggeriscono che il legame tra umani adulti e animali, sebbene duraturo, intenso e psicologicamente ed emotivamente importante, può essere visto come un legame di affetto e non come un vero e proprio legame di attaccamento.