



A mini review on the dog-owner attachment bond and its implications in veterinary clinical ethology

Giacomo Riggio

Department of Veterinary Sciences, University of Pisa.

Abstract: The dog-owner relationship seems to share several features with the child-mother attachment bond. In this review, we will first briefly explain the attachment theory in the context of the child-caregiver relationship in order to provide a background to the dog-owner attachment bond research. Then, we will retrace the steps that led to the current view of the dog-owner relationship as an attachment bond, with a specific focus on those studies that investigated the dog's attachment behavior towards the owner. We will briefly examine the implications of this theory in the field of veterinary clinical ethology and finally discuss its critical points and future directions.

Key Words: dog; attachment; bond.

* *Corresponding Author:* giacomoriggio@gmail.com

Introduction

As dogs become more and more an integral part of human life and society there is an ever-growing interest in understanding the relationship between them and their owners. While several studies have investigated the owner's perception of this relationship, fewer studies have focused on the dog's point of view. The application of the attachment theory to dog-owner dyads offered a new scientific perspective on the dynamics that shape and regulate the dog-human relationship, as well as a new methodological approach to investigate the quality of the dog attachment bond towards the owner (Solomon et al., 2019). The aim of this review is 1) to briefly explain the attachment theory in the context of the child-caregiver relationship in order to provide a background to the dog-owner attachment bond research; 2) to retrace the steps that led to the current view of the dog-owner relationship as an attachment bond, with a specific focus on those studies that investigated the dog's attachment behavior towards the owner; 3) to briefly examine the implications of this theory in the field of veterinary clinical ethology; 4) to finally discuss its critical points and future research directions.

The child attachment to the caregiver

The attachment theory was originally developed by Bowlby in the late 50s (Bowlby, 1958) to propose a different explanation than the psychoanalytic drive theory to the nature of the child's tie to the mother (Bretherton, 1992). Basing his ideas on ethological and evolutionary concepts, he theorized that infants come into the world with an innate capacity to promote proximity with the caregiver through a repertoire of pre-programmed behaviors, such as smiling, crying, clinging, following and sucking (Bowlby, 1958). With experience, such behaviors become integrated

into an attachment behavioral system whose activation depends on both inner, environmental and contextual variables. The purpose of the activation of such behavioral system is to increase proximity with the caregiver, as well as to encourage the caregiver to display behaviors of care and protection towards the infant, with the ultimate evolutionary goal of increasing his chances of survival. It is important to understand the conceptual distinction between attachment and attachment behaviors. While the former describes an enduring emotional bond between an infant and his caregiver, the latter refers to the set of behaviors through which such bond is formed and regulated (Ainsworth et al., 2015). While attachment behaviors may not be observable in some contexts of the infant-caregiver relationship, the attachment bond may still be present. This is because infant's attachment behaviors are mainly activated in response to either inner (e.g. hunger, sickness, pain) or environmental stressful conditions, such as perceived threatening social or environmental stimuli and increased distance or separation from the caregiver (Ainsworth et al., 2015). The concept of separation is particularly important to understand the biological function of the attachment system (Ainsworth & Bell, 1970). In all mammals, early during the infant growth, increases in distance from the caregiver become necessary for exploring, experiencing and learning about the environment (Ainsworth & Bell, 1970). The attachment system does not aim to prevent exploration and learning. On the contrary, it controls and coordinates behaviors aimed to maintain or increase proximity and those aimed to support exploration and learning in a dynamic balance that promotes safety, as well as the experience necessary for an appropriate psychophysical development (Bowlby, 1969, 1973; Waters, 2008; Ainsworth, 2015). The regulatory function of the attachment system over proximity seeking and exploratory behaviors is reflected into the four essential elements that characterize the infant attachment bond to the caregiver: (1) contact maintenance, that is the infant tend to maintain physical contact and proximity with the attachment figure; (2) searching response (or protest at separation), that is the infant's behavioral response to involuntary separations from the attachment figure; (3) secure base effect, i.e., the infant uses the attachment figure as a base from which to explore the environment; (4) safe haven effect, i.e., the infant uses the attachment figure to find protection and feel safe in times of threat or distress (Ainsworth, 1969; Ainsworth & Bell 1970; Ainsworth et al., 1972; Bowlby, 1988; Kerns et al., 2015).

Over time, the infant makes and internalizes experiences of his primary caregiver's responses to his attachment behavior. Through this process, he forms cognitive representational models – also called internal working models (Bowlby, 1988) – that generate expectations of how the attachment figure will respond to his need of protection, comfort and security (Chambers, 2017). Furthermore, the infant will use these mental representations to find behavioral strategies – also called patterns or styles – to achieve his ultimate goal of feeling safe and protected.

To date, four infant attachment styles, namely secure, insecure ambivalent/resistant, insecure avoidant and disorganized, have been identified through extensive observation of infant-caregiver interactions in a home environment, that strongly relate to the quality of the attachment figure's caregiving behavior. These styles have been further studied through the Strange Situation Procedure (SSP), a 20-minute-long semi-structured laboratory test specifically designed by Ainsworth et al. (Ainsworth, 1969; Ainsworth & Bell, 1970) to progressively increase the infant's level of stress and consequently activate his attachment behavioral system. Potential sources of stress for the infant undergoing the SSP are represented by the presence of a stranger, by the unfamiliar environment in which the test takes place and, most importantly, by repeated bouts of separation and reunions with the attachment figure (Van Rosmalen et al., 2015).

Briefly, securely attached infants have caregivers that consistently respond in a sensitive and supportive way to their needs. They learn that they can freely express their negative emotions to elicit care and comforting behavior from the caregiver (Benoit, 2004). Insecurely-avoidant attached infants have caregivers that consistently respond to their needs in a rejecting way. So, they learn to de-activate their attachment behavior (e.g. avoid, ignore the caregiver when distressed,

do not display overt signs of distress) not to experience rebuffering (Benoit, 2004). Insecurely-ambivalent infants have caregivers who respond inconsistently and unpredictably to their needs. Therefore, they learn to hyper-activate their attachment behavior in order to have more chances to induce a sensitive response by the caregiver (Benoit, 2004). The term ambivalent is due to the fact that these individuals manifest extreme desire to get physically comforted when distressed, although they reject, at the same time, the caregiver's attempts to provide comfort (Ainsworth et al., 2015). Lastly, disorganized pattern is displayed when the infant perceives the caregiver as source of fear. It may develop with abusive, traumatizing, neglectful caregiver's behavior. These infants are not able to put in place any organized strategy to achieve a sense of safety from the caregiver's behavior, since the latter is perceived also as the source of their fright. They may thereby display incoherent, contradictory, misdirected, stereotypic, and fearful behavior especially when distressed in the presence of the attachment figure (Van Ijzendoorn et al., 1999).

The dog attachment to the caregiver

There is little scientific and empirical doubt that humans and dogs are tied by an affective bond. Nonetheless, as previously mentioned, not all bonds are attachment bonds (Benoit, 2004). Therefore, when interest in the attachment theory first arose in the field of anthrozoology, researchers took efforts in trying to understand whether the dog-owner relationship possessed those features that characterize this specific type of relationship. A first ground-breaking study on dog attachment behavior was carried out by Topal et al. (1998) through the adaptation of the SSP on dog-human dyads. The use of such procedure (which is used in 12- to 18-month-old human infants) to assess the behavior of adult subjects was supported by evidence of dogs showing infant-like attachment behavior (i.e., being distressed by separation from the owner and excited by the reunion), as well as by a millennial artificial selection that brought dogs to develop enduring, asymmetrical relationship with their human counterparts (e.g. by selecting for pedomorphic features). Their findings suggested that dogs show behaviors indicative of attachment to the owner, such as separation distress – that was not attenuated by the presence of the stranger –, proximity/contact seeking and maintenance behavior during reunion – that were not equally performed towards the stranger – and, most importantly, a greater engagement in exploration and play activities in the presence of the caregiver that testifies to the secure base effect. However, Prato Previde et al. (2003) argued that the results obtained only reflected a preference for the caregiver compared with the stranger and, in some cases, the order in which the SSP episodes were presented rather than a real secure base effect. Since then, several researchers developed their own counterbalanced version of the SSP, or even used different procedures, to finally arrive to the conclusion that the dog-owner relationship shares the same distinctive features with the child-caregiver attachment bond: contact maintenance (Palmer & Custance, 2008; Mariti et al., 2013), separation distress (Palestrini et al., 2005; Palmer & Custance, 2008); secure base effect (Palmer & Custance, 2008; Horn et al., 2013; Mariti et al., 2013), safe haven effect (Gacsi et al., 2013).

However, all these studies based their investigation of dog-owner attachment on the assessment of quantitative measures (i.e., frequency and duration) of dogs' behaviors during the SSP or similar procedures. While, on one hand, quantitative measures allow for greater coding standardization and may as well represent the most useful approach to describe normative trends of behavior across episodes (Ainsworth et al., 2015), on the other, they have not proved useful in identifying individual differences in infant behavior in the SSP, as they make it more difficult to retain the qualitative aspects of interaction that are at the bottom of pattern classification (Ainsworth et al., 2015; Solomon et al., 2019). Schöberl et al. (2016) were the first to develop a dog-adapted version of the four-style classification used for human infants (Main & Solomon, 1986; 1990) in order to

adopt a qualitative approach to the investigation of dog-caregiver attachment bond. They were able to correlate dog attachment patterns to the owner to physiological parameters of stress during the SSP. Specifically, they found a significantly lower cortisol reactivity in dogs classified as securely attached compared to those classified as insecurely attached. For statistical reasons, they performed their analyses on dogs classified as avoidant, ambivalent and disorganized subjects as one single “insecure” group. More recently, Solomon et al. (2019), which used the same sample and classification procedure as Schöberl et al. (2016), found a negative correlation between insecure patterns – again, classified as avoidant, ambivalent and disorganized, but grouped in a general “insecure” category for the purpose of analysis – and the caregiver’s reassuring presence during a “threatening stranger” test, as well as the owner reported dog’s personality trait “active/excitable” on the Monash Canine Personality Questionnaire-Revised (MCPQ-R). Although in both of these studies, researchers were able to classify dogs with the same attachment patterns observed in children, they did not test the soundness of their classification scheme for any of the patterns reported. However, a very recent study by Riggio et al. (2021) found that dogs classified as secure and avoidant showed distinctive attachment behavior during the SSP, which strongly resembled those reported for children with the same attachment styles. As opposed to previous studies, the classification they used was more focused on those key aspects that characterize the progression of attachment behavior throughout the SSP rather than on specific behaviors or behavioral sequences observed within each episode. This approach may have also allowed them to achieve a higher inter-observer agreement compared to that reported in previous studies (Riggio et al., 2021). Contrary to secure dogs, avoidant dogs did not show an increase in proximity/contact seeking behavior towards neither the owner nor the stranger with the progression of the test. Furthermore, while secure dogs consistently showed more behaviors indicative of separation distress in the absence of the owner than in the absence of the stranger, avoidant dogs did so only during the first bout of separations. This is not surprising, as the SSP is specifically designed to progressively increase the level of stress of the subjects tested making their attachment patterns more evident during the final episodes of the procedure. Moreover, it suggests that shortened versions of the SSP, which have been used in several previous studies (Thielke et al., 2019; Thielke et al., 2020; Wanser et al., 2019; Wanser et al., 2020), although useful to assess dogs’ separation-related behavior in a standardized environment, may not be appropriate to identify different attachment patterns. Overall, while current research on dog-owner attachment seem to confirm the presence of a secure and an insecure behavioral pattern, the validity of the four-style classification model used for human infants requires further investigation.

Attachment in veterinary clinical ethology

As mentioned above, human infants build internal working models through the experience of repeated interactions with the caregiver. Such mental representations of the self and the other are used to predict the caregiver’s behavior and, consequently, they also shape the child’s own behavior within the context of the relationship. Perhaps more importantly, they influence the child’s expectations of other attachment bonds (e.g. romantic relationships, friendships) that he will form, as he grows older, with individuals different from the primary caregiver. Therefore, they play a critical role in shaping the individual’s cognitive, emotional, behavioral and social development. With this in mind, it is not surprising that insecure attachment appears to be a risk factor for the development of psychological disorders in both young and adult individuals (Colonnesi et al., 2011; Jinyao et al., 2012; Mikulincer & Shaver, 2012; Chambers, 2017). However, while in human psychiatry this link has been extensively investigated for a variety of disorders, such as panic (Manicavasagar et al., 2009), aggression (Mikulincer & Shaver, 2011), anxiety (Muris et al., 2001, Schimmenti & Bifulco, 2013), depression (Spruit et al., 2020), OCD (van Leeuwen et al., 2020), and personality

disorders (Lorenzini & Fonagy, 2013), so far, only a few studies in the field of veterinary clinical ethology, have attempted to correlate dog-to-owner attachment patterns to dog emotional and behavioral problems. A very recent study by Asher et al. (2020) found insecurely attached dogs to be more disobedient than securely attached dogs during adolescence. Furthermore, they found that the decrease in responsiveness to commands was only seen when the command was given by the caregiver and not by a stranger. In human psychology, insecure attachment to parents seems to be related to the quality of the child-parent conflict (e.g. how it is managed and resolved) rather than the frequency of conflict interactions (Ducharme et al., 2002; Laible et al., 2008; Shumaker, 2009), which is usually higher in both securely and insecurely attached children during adolescence, regardless of their attachment pattern (Ducharme et al., 2002; Shumaker, 2009). Nonetheless, findings by Asher et al. (2020) raise the question of whether dog behavior professionals should approach dog disobedient behavior as a mere educational problem (i.e., with the sole use of training techniques aimed at improving obedience) or they should consider, in both preventative and rehabilitative interventions, the emotional and relational framework behind its display.

Interestingly, it is not just dog disobedient behavior to have been linked to suboptimal attachment bonds with the owner, but also the method used by the latter to train the dog. Viera de Castro et al. (2019) found that dogs trained with aversive-based techniques did not show a significant or did not show at all – depending on the SSP version used – a preference for the owner versus the stranger in relation to play and greeting behavior, which are measures of secure base and safe haven effect. This is not surprising, as by definition, aversive training methods tend to ignore the dog motivational states and induce negative emotions (Fernandes et al., 2017, Vieira de Castro et al., 2020). Repeated interactions – as occur in training – in which the caregiver-in this case the owner – does not respond sensitively to the dog's motivational and emotional states, or even becomes the source of the dog's negative emotions, are just what it takes for the dog to develop a suboptimal or even a deviant attachment bond toward the owner.

Since there is some scientific evidence that aversive-based training is less effective than reward-based training (Hiby et al., 2004; Haverbeke et al., 2008; Blackwell et al., 2012), it would be interesting to investigate whether disobedience – even in other periods of the dog's life than the adolescent phase – is a direct consequence of an insecure attachment bond or a collateral effect of using less effective aversive training techniques, which in turn may affect the relationship with the owner (Todd, 2018; La Follette et al., 2019).

An emotional disorder that is commonly associated with insecure-ambivalent attachment in human infants is separation anxiety (Colonnesi et al., 2011). Being unable to predict whether or not their caregiver will be available in times of need, ambivalent children tend to develop a feeling of abandonment that ultimately leads to increased vigilance, reduced autonomy, limited exploration and, of course, extreme manifestations of distress during separation from the attachment figure (Colonnesi et al., 2011).

On the contrary, in veterinary clinical ethology, dog separation anxiety has commonly been associated with “hyperattachment” (Appleby et al., 2003; Sherman & Mills, 2008) rather than insecure attachment towards the owner. Appleby et al.'s (2003) diagnostic model for separation anxiety categorized dogs into three different groups according to the motivation behind their anxious behavior. Briefly, dogs in group A were defined as “hyperattached” as their anxious behavior was triggered by separation with a specific person; dogs in group B were upset by changes in familiarity, routine or environmental stimuli; dogs in group C were phobic individuals who had associated the presence of aversive stimuli (e.g. thunderstorms) with the being left alone (Sherman et al., 2008). A critique to the concept of “hyperattachment” was moved, among others, by Parthasarathy et al. (2006), which suggested that dog separation anxiety could be caused by dysfunctional attachment with owners. However, the one study to directly assess the link between dog attachment styles and separation anxiety behavior was only recently carried out by Konok et al. (2019).

According to their results, they suggest that dog separation distress is associated with the dog's ambivalent attachment style. However, in this study, dog attachment styles were deduced solely based on the owner's perception the dog's manifestations of separation distress and greeting behavior rather than being identified a priori through specific investigation (Konok et al., 2019). Further studies should focus on assessing whether the proportion of specific attachment styles is different between dogs with and without separation anxiety, or on the opposite, whether a variable prevalence of separation-related disorders can be found in dogs with different attachment styles. Further confirmation of the link between insecure attachment and separation anxiety in dogs may have major implications in how dog behavior professionals prevent and treat such disorder. Their intervention may have to change from being almost exclusively focused the dog cognitive-behavioral therapy in the specific context of separation to systematically taking into account the overall quality of the relationship, as well as the owner's caregiving behavior in multiple contexts of the dog's life.

Critical points and future research direction

As Savalli & Mariti (2020) point out the child-caregiver approach explains good part of the dog-owner relationship. An owner sets rules, makes decisions for the dog, directly appeases most of his physiological needs and provides security. This characterizes the asymmetry of the relationship that is typical of a normal child-caregiver relationship. Nonetheless, except for one study that focused on puppies (Mariti et al., 2020), most of the current research on dog-owner attachment involved adult owners and adult dogs. As a matter of fact, attachment bonds between adult humans (e.g. friendships, romantic relationships) differ from child-caregiver bonds in terms of role symmetry. In such instances, there is not one individual playing the role of caregiver and one individual playing the role of care recipient, but both parties can interchangeably play both roles depending on context and individual needs (Savalli & Mariti, 2020). Previous studies that investigated the owners' perspective of the relationship with their dog suggest that the latter may also play the role of an attachment figure (Kurdek, 2008; Kurdek, 2009a; Zilcha-Mano et al., 2011a; Meehan et al., 2017) as they may be perceived as secure base and safe haven by their human counterpart (Kurdek, 2009b; Zilcha-Mano et al., 2011b; Zilcha-Mano et al., 2012). Indeed, these findings imply that the infant-caregiver attachment bond model may not satisfactorily explain the complexity of the dog-owner relationship. Furthermore, attached adult individuals do not usually express their attachment behavior with the same intensity and frequency as infants do (Kerns et al., 2015). For instance, an adult person tend not to cry in despair when separated from a friend or a romantic partner in their daily life, but may still feel some degree of anxiety about it. Similarly, the secure base effect, although still representing a relevant aspect of adult attachment (Crowell et al., 2002), may not be expressed through proximity/contact seeking behavior and a sense of comfort in exploring the environment in the presence of the attachment figure. In fact, the quality of adult human attachment is commonly investigated through interviews and self-reports aimed at assessing the person's mental representations of the relationship (Ravitz et al., 2010), rather than through the SSP or other procedures that focus on actual attachment behavior. This raises the question of whether the SSP may be considered as an appropriate test to investigate and fully comprehend all aspects of the dog-owner attachment bond. It would be logical to think that the SSP may represent a valid tool to investigate those aspects of the dog-owner relationship that reflect features typical of the child-caregiver bond, but may not be as suitable for assessing other aspects of the relationship that appear to be more consistent with the adult attachment model (Savalli & Mariti, 2020). Although challenging, different assessment methods should be sought to achieve this purpose.

Another critical point in the study of dog-owner attachment is that it refers to a bond between individuals of two different species. While this may not affect how the underlying construct of the

attachment theory applies to the relationship, it may prompt some considerations on the quality of both parties' interactive behavior.

For instance, what are the practical features of a caregiving behavior that would allow owners to develop an optimal bond with their dogs? Or do insecurely attached dogs display their insecurity through the same behavioral patterns observed in human infants? As for the former question, deeper investigation of both dog intra – (Prato-Previde et al., 2009; Mariti et al., 2014; Mariti et al., 2017, Mariti et al., 2018) and interspecific attachment may provide useful clues to understand how a caregiver should act in order to be perceived by the dog as a sensitive and responsive attachment figure. As for the latter, researchers may benefit from not assuming that the behavioral expression of a given attachment style may be the same for dogs and children. While there is some evidence that dogs classified as insecure-avoidant show attachment behavioral patterns similar to those reported for children, ambivalent dogs seem not to show that “resistance to contact” that characterizes insecure ambivalent infants (Solomon et al., 2019). While this may be the consequence of a domestication process that selected against dogs' manifestations of anger towards humans (Solomon et al., 2019), it may also be related to the way dogs display their ambivalence/resistance towards the caregiver. For instance, we expect ambivalent infants to show extreme desire for physical contact while rejecting angrily the caregiver attempts to initiate and maintain that contact.

However, tactile communication and expression of affective states through physical contact are prominent features of human and animal social behavior (Dunbar et al., 2010; Baragli et al., 2009; Jablonski et al., 2016). Although important in some social contexts and interactions, physical contact as a means to communicate with conspecifics is infrequent and short-lasting in dogs (Siniscalchi et al., 2018). Both this and the fact that dogs involved in attachment studies are mostly adult individuals may affect their need to be in physical contact with the attachment figure in order to feel safe and protected. Therefore, also ambivalent dogs' resistant behavior may not be as easy to identify through behavioral observation as it is in human infants (Solomon et al., 2019).

References

- Ainsworth M. D. S. Object relations, dependency, and attachment: A theoretical review of the infant-mother relationship. *Child development*. 969-1025; 1969.
- Ainsworth M. D. S., & Bell S. M. (Attachment, exploration, and separation: Illustrated by the behavior of one-year-olds in a strange situation. *Child development*., 49-67; 1970.
- Ainsworth M. D. S., Bell S. M., Stayton, D. J. Individual differences in the development of some attachment behaviors. *Merrill-Palmer Quarterly of Behavior and Development*. 18: 123-143; 1972.
- Ainsworth M., Blehar M. C., Waters E., Wall S. N. *Patterns of Attachment. A Psychological Study of the Strange Situation*. Classic Psychology Press: London, UK; 2015.
- Appleby D. & Pluijmakers J. Separation anxiety in dogs. The function of homeostasis in its development and treatment. *The Veterinary Clinics of North America. Small Animal Practice*, 33: 321-344; 2003.
- Asher L., England G. C., Sommerville R., Harvey N. D. Teenage dogs? Evidence for adolescent-phase conflict behavior and an association between attachment to humans and pubertal timing in the domestic dog. *Biology letters*, 16(5), 20200097; 2020.
- Baragli P., Gazzano A., Martelli F., Sighieri C. How do horses appraise human's actions? A brief note over a practical way to assess stimulus perception. *J. Equine Vet. Sci.* 29:739-42; 2009.
- Benoit D. Infant-parent attachment: Definition, types, antecedents, measurement and outcome. *Paediatrics & Child Health*. 9: 541-545; 2004.
- Blackwell E. J., Bolster C., Richards G., Loftus B. A., Casey R. A. The use of electronic collars for training domestic dogs: estimated prevalence, reasons and risk factors for use, and owner perceived success as compared to other training methods. *BMC Veterinary Research*. 8: 1-11; 2012.
- Bowlby J. The nature of the child's tie to his mother. *Int. Psycho-Analysis*. 39: 1-23; 1958.
- Bowlby J. *Attachment and loss, Vol. I: Attachment*. New York: Basic Books. 1969.

- Bowlby J. Attachment and loss, Vol. 2: Separation. New York: Basic Books. 1973.
- Bowlby J. A secure base: Parent-child attachment and healthy human development. New York: Basic Books. 1988.
- Bretherton I. The origins of attachment theory: John Bowlby and Mary Ainsworth. *Developmental psychology*. 28: 759-775; 1992.
- Chambers J. The neurobiology of attachment: From infancy to clinical outcomes. *Psychodynamic psychiatry*. 45: 542-563; 2017.
- Colonnese C., Draijer E. M., Jan J. M., Stams G., Van der Bruggen C. O., Bögels S. M., Noom M. J. The relation between insecure attachment and child anxiety: A meta-analytic review. *J. Clin. Child & Adolescent Psychol.* 40: 630-645; 2011.
- Crowell J. A., Treboux D., Gao Y., Fyffe C., Pan H., Waters E. Secure base behavior in adulthood: Measurement, links to adult attachment representations, and relations to couples' communication and self-reports. *Develop. Psychol.* 38 679-693; 2002.
- de Castro A. C. V., Barrett J., de Sousa L., Olsson I. A. S. Carrots versus sticks: The relationship between training methods and dog-owner attachment. *Appl. Anim. Behav. Sci.* 219: 104831; 2019.
- Ducharme J., Doyle A. B., Markiewicz D. Attachment security with mother and father: Associations with adolescents' reports of interpersonal behavior with parents and peers. *J. Social Personal Relationships*. 19: 203-231; 2002.
- Dunbar R. I. The social role of touch in humans and primates: behavioral function and neurobiological mechanisms. *Neurosci. & Biobehav. Rev.* 34: 260-268; 2010.
- Fernandes J. G., Olsson I. A. S., de Castro A. C. V. Do aversive-based training methods actually compromise dog welfare? A literature review. *Appl. Anim. Behav. Sci.* 196: 1-12; 2017.
- Gácsi M., Maros K., Sernkvist S., Faragó T., Miklósi Á. Human analogue safe haven effect of the owner: behavioral and heart rate response to stressful social stimuli in dogs. *PLoS One*. 8: e58475; 2013.
- Haverbeke A., Laporte B., Depiereux E., Giffroy J. M., Diederich C. Training methods of military dog handlers and their effects on the team's performances. *Appl. Anim. Behav. Sci.* 113: 110-122; 2008.
- Hiby E. F., Rooney N. J., Bradshaw J. W. S. Dog training methods: their use, effectiveness and interaction with behavior and welfare. *Animal Welfare*. 13: 63-70; 2004.
- Horn L., Huber L., Range F. The importance of the secure base effect for domestic dogs-evidence from a manipulative problem-solving task. *PloS one* 8: e65296; 2013.
- Jablonski N. G. Social and affective touch in primates and its role of skin in the evolution of social cohesion. *Neuroscience*. In press.
- Jinyao Y., Xiongzhao Z., Auerbach R. P., Gardiner C. K., Lin C., Yuping W., Shuqiao Y. Insecure attachment as a predictor of depressive and anxious symptomology. *Depression & Anxiety*. 29: 789-796; 2012.
- Kerns K. A., Mathews B. L., Koehn A. J., Williams C. T., Siener-Ciesla S. Assessing both safe haven and secure base support in parent-child relationships. *Attachment & human development*. 17: 337-353; 2015.
- Konok V., Marx A., Faragó T. Attachment styles in dogs and their relationship with separation-related disorder – A questionnaire-based clustering. *Appl. Anim. Behav. Sci.* 213: 81-90; 2019.
- Kurdek L. A. Pet dogs as attachment figures. *J. Social Personal Relationships*. 25: 247-266; 2008.
- Kurdek L. A. Pet dogs as attachment figures for adult owners. *J. Fam. Psychol.* 23: 439; 2009a.
- Kurdek L. A. Young adults' attachment to pet dogs: Findings from open-ended methods. *Anthrozoös*. 22: 359-369; 2009b.
- LaFollette M. R., Rodriguez K. E., Ogata N., O'Haire M. E. Military veterans and their PTSD service dogs: associations between training methods, PTSD severity, dog behavior, and the human-animal bond. *Frontiers in Veterinary Science*. 6: 23; 2019.
- Laible D., Panfile T., Makariev D. The quality and frequency of mother-toddler conflict: Links with attachment and temperament. *Child Development*. 79: 426-443; 2008.
- Lorenzini N., Fonagy P. Attachment and personality disorders: A short review. *Focus*. 11: 155-166; 2013.
- Main M. & Solomon J. Discovery of an insecure-disorganized/disoriented attachment pattern. In T. B. Brazelton & M. W. Yogman (Eds.), *Affective development in infancy* (pp. 95-124). Ablex Publishing. (1986).
- Main M., & Solomon J. Procedures for identifying infants as disorganized/disoriented during the Ain-

- sworth Strange Situation. Attachment in the preschool years: Theory, research, and intervention. 1: 121-160; 1990.
- Manicavasagar V., Silove D., Marnane C., Wagner R. Adult attachment styles in panic disorder with and without comorbid adult separation anxiety disorder. *Australian & New Zealand J. Psychiatry.* 43: 167-172; 2009.
- Mariti C., Carlone B., Ricci E., Sighieri C., Gazzano A. Intraspecific attachment in adult domestic dogs (*Canis familiaris*): Preliminary results. *Appl. Anim. Behav. Sci.* 152: 64-72; 2014.
- Mariti C., Carlone B., Sighieri C., Campera M., Gazzano A. Dog behavior in the Ainsworth Strange Situation Test during separation from the owner and from the cohabitant dog. *Dog Behavior.* 4: 1-8; 2018.
- Mariti C., Carlone B., Votta E., Ricci E., Sighieri C., Gazzano A. Intraspecific relationships in adult domestic dogs (*Canis familiaris*) living in the same household: A comparison of the relationship with the mother and an unrelated older female dog. *Appl. Anim. Behav. Sci.* 194: 62-66; 2017.
- Mariti C., Lenzini L., Carlone B., Zilocchi M., Ogi A., Gazzano A. Does attachment to man already exist in 2 months old normally raised dog puppies? A pilot study. *Dog Behavior.* 1: 1-11; 2020.
- Mariti C., Ricci E., Zilocchi M., Gazzano A. Owners as a secure base for their dogs. *Behavior.* 150: 1275-1294; 2013.
- Meehan M., Massavelli B., Pachana N. Using attachment theory and social support theory to examine and measure pets as sources of social support and attachment figures. *Anthrozoös.* 30: 273-289; 2017.
- Mikulincer M., Shaver P. R. An attachment perspective on psychopathology. *World Psychiatry.* 11: 11-15; 2012.
- Muris P., Meesters C., Van Melick M., Zwambag L. Self-reported attachment style, attachment quality, and symptoms of anxiety and depression in young adolescents. *Personality & Individual Differences.* 30: 809-818; 2001.
- Palestrini C., Previde E. P., Spiezio C., Verga M. Heart rate and behavioral responses of dogs in the Ainsworth's Strange Situation: A pilot study. *Appl. Anim. Behav. Sci.* 94: 75-88; 2005.
- Palmer R. & Custance D. A counterbalanced version of Ainsworth's Strange Situation Procedure reveals secure-base effects in dog-human relationships. *Appl. Anim. Behav. Sci.* 109: 306-319; 2008.
- Parthasarathy V. & Crowell-Davis S. L. Relationship between attachment to owners and separation anxiety in pet dogs (*Canis lupus familiaris*). *J. V. B.* 1: 109-120; 2006.
- Prato-Previde E. P., Ghirardelli G., Marshall-Pescini S., Valsecchi P. Intraspecific attachment in domestic puppies (*Canis familiaris*). *J. V. B.* 2: 89-90; 2009.
- Prato-Previde E., Custance D. M., Spiezio C., Sabatini F. Is the dog-human relationship an attachment bond? An observational study using Ainsworth's strange situation. *Behavior.* 140: 225-254; 2003.
- Ravitz P., Maunder R., Hunter J., Sthankiya B., Lancee W. Adult attachment measures: A 25-year review. *J. Psychosomatic Research.* 69: 419-432; 2010.
- Savalli C., Mariti C. Would the Dog Be a Person's Child or Best Friend? Revisiting the Dog-Tutor Attachment. *Front Psychol.* 2020; 11: 576713. doi: 10.3389/fpsyg.2020.576713.
- Schimmenti A. & Bifulco A. Linking lack of care in childhood to anxiety disorders in emerging adulthood: the role of attachment styles. *Child and Adolescent Mental Health.* 20: 41-48; 2015.
- Schöberl I., Beetz A., Solomon J., Wedl M., Gee N., Kotschal K. Social factors influencing cortisol modulation in dogs during a strange situation procedure. *J. V. B.* 11: 77-85; 2016.
- Sherman B. L. & Mills D. S. Canine anxieties and phobias: an update on separation anxiety and noise aversions. *Vet. Clin. North Am. Small Anim. Practice.* 38: 1081-1106; 2008.
- Shumaker D. M., Deutsch R. M., Brenninkmeyer L. How do I connect? Attachment issues in adolescence. *J. Child Custody.* 6: 91-112; 2009.
- Siniscalchi M., d'Ingeo S., Minunno M., Quaranta A. Communication in dogs. *Animals.* 8: 131-143; 2018.
- Solomon J., Beetz A., Schöberl I., Gee N., Kotschal K. Attachment security in companion dogs: adaptation of Ainsworth's strange situation and classification procedures to dogs and their human caregivers. *Attachment & human development.* 21: 389-417; 2019.
- Spruit A., Goos L., Weenink N., Rodenburg R., Niemeyer H., Stams G. J., Colonnese C. The relation between attachment and depression in children and adolescents: A multilevel meta-analysis. *Clinical child and family Psychol. Rev.* 23: 54-69; 2020.

- Thielke L. E., & Udell M. A. Evaluating cognitive and behavioral outcomes in conjunction with the secure base effect for dogs in shelter and foster environments. *Animals*. 9: 932-941; 2019.
- Thielke L. E. & Udell M. A. Characterizing human–dog attachment relationships in foster and shelter environments as a potential mechanism for achieving mutual wellbeing and success. *Animals*. 10: 67-75; 2020.
- Todd Z. Barriers to the adoption of humane dog training methods. *J. V. B.* 25: 28-34; 2018.
- Topál J., Miklósi Á., Csányi V., Dóka A. Attachment behavior in dogs (*Canis familiaris*): a new application of Ainsworth's (1969) Strange Situation Test. *J. Comp. Psychol.* 112: 219-225; 1998.
- Van Ijzendoorn M. H., Schuengel C., Bakermans-Kranenburg, M. J. Disorganized attachment in early childhood: Meta-analysis of precursors, concomitants, and sequelae. *Development and Psychopathology*. 11: 225-250; 1999.
- Van Leeuwen W. A., Van Wingen G. A., Luyten P., Denys D., Van Marle H. J. F. Attachment in OCD: A meta-analysis. *J. Anxiety Disorders*. 70: 102187; 2020.
- Van Rosmalen L., Van der Veer R., Van der Horst F. Ainsworth's strange situation procedure: The origin of an instrument. *J. History Behav. Sci.* 51: 261-284; 2015.
- Vieira de Castro A. C., Fuchs D., Morello G. M., Pastur S., de Sousa L., Olsson I. A. S. Does training method matter? Evidence for the negative impact of aversive-based methods on companion dog welfare. *Plos one*. 15: e0225023; 2020.
- Wanser S. H. & Udell M. A. Does attachment security to a human handler influence the behavior of dogs who engage in animal assisted activities? *Appl. Anim. Behav. Sci.* 210, 88-94; 2019.
- Wanser S. H., Simpson A. C., MacDonald M., Udell M. A. Considering family dog attachment bonds: Do dog-parent attachments predict dog-child attachment outcomes in animal-assisted interventions? *Frontiers in Psychology*. 11: 2293; 2020.
- Waters E. Live long and prosper: A note on attachment evolution. Available online: http://www.psychology.sunysb.edu/attachment/gallery/live_long/live_long.html (2008).
- Zilcha-Mano S., Mikulincer M., Shaver P. R. An attachment perspective on human–pet relationships: Conceptualization and assessment of pet attachment orientations. *J. Res. Personality*. 45: 345-357; 2011a.
- Zilcha-Mano S., Mikulincer M., Shaver P. R. Pet in the therapy room: An attachment perspective on animal-assisted therapy. *Attachment & Human Development*. 13: 541-561; 2011b.
- Zilcha-Mano S., Mikulincer M., Shaver P. R. Pets as safe havens and secure bases: The moderating role of pet attachment orientations. *J. Res. Personality*. 46: 571-580; 2012.

Mini review sul legame di attaccamento tra cane e proprietario e le sue implicazioni nella clinica comportamentale

Giacomo Riggio

Dipartimento di Scienze Veterinarie, Università di Pisa.

Sintesi

La relazione cane-proprietario sembra condividere diverse caratteristiche con il legame di attaccamento bambino-madre. In questa review, prima spiegheremo brevemente la teoria dell'attaccamento nel contesto della relazione bambino-caregiver al fine di fornire un background alla ricerca sul legame di attaccamento del proprietario del cane. Quindi, ripercorreremo i passaggi che hanno portato alla visione attuale della relazione cane-proprietario come legame di attaccamento, con un focus specifico su quegli studi che hanno indagato il comportamento di attaccamento del cane nei confronti del proprietario. Esamineremo brevemente le implicazioni di questa teoria nel campo dell'etologia clinica veterinaria e infine discuteremo i suoi punti critici e gli sviluppi futuri.