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Children with Avoidant or Disorganized Attachment Relate Differently to a Dog and to Humans During a Socially Stressful Situation

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ABSTRACT Human attachment representations are shaped in interaction with the primary caregiver and are generally transferred to further bonding/social partners later in life. According to previous evidence, primary attachment representations acquired with humans do not seem to be transferred to companion animals. This was held as a major factor why such animals would effectively provide social support also to persons with insecure attachment. The aim of this study in 19 male children, 7–11 years of age and with insecure-avoidant or disorganized attachment, was to investigate differences in their social behavior and in physiological responses when socially supported by an unfamiliar therapy dog in a socially stressful situation. The Trier Social Stress Test for Children (TSST-C) was conducted to elicit stress in the children when in the presence of the dog and a female human investigator. We found that boys with disorganized attachment (n = 11) communicated more intensely than avoidantly attached boys (n = 8) with both the dog and humans present. Boys with a disorganized attachment had more physical contact with the dog during the TSST-C and talked more to the dog during and after the TSST-C than did boys with an insecure-avoidant attachment. While the prevailing wisdom holds that attachment representations acquired with the primary human caregiver would not transfer to companion animals, our data indicate otherwise. At least components of attachment-related interaction styles, such as degree of contact seeking in verbal and tactile interactions are also displayed in interaction with animal partners.

Keywords: attachment, companion animals, human–dog interaction, social support, stress regulation

Attachment comes with a behavioral system evolved to maintain spatial proximity to a caregiver to ensure offspring protection and caregiving. In situations perceived as stressful or dangerous, a set of attachment behaviors is evoked in the offspring (Bowlby 1958, 1972). The balance between proximity seeking and maintenance and exploration by the offspring and availability, accessibility, reliability, and sensitivity of the caregiver are considered the crucial behavioral indicators determining the quality of parent–infant attachment in humans (Bowlby 1972).

Human attachment representation (i.e., the internal working model, IWM; Bowlby 1969) develops individually in early life through interaction with the primary caregiver. This mental representation is strongly linked to affectivity and is mainly subconsciously represented; it is connected to the mental representations of self and others and the relationships between these two. Hence, the IWM determines the expectations of individuals when relating socially to others (Bretherton 1985). The IWM seems to be relatively stable over time, compared with other representations formed later in life (Bowlby 1973).

While children with secure attachment actively seek care and comfort from their caregivers in stressful situations (Ainsworth et al. 1978; Matas, Arend and Sroufe 1978; Main, Kaplan and Cassidy 1985; Cassidy 1986; Vaughn and Waters 1990; Steele, Steele and Johansson 2002; Sroufe et al. 2005), children with insecure-avoidant attachment tend to avoid proximity and contact with their caregiver when distressed. Instead they engage in alternative tactics, such as distracting themselves by emphasizing exploratory behavior rather than relating to their caregivers (Ainsworth and Witting 1969; Ainsworth, Bell and Stayton 1971).

While avoidant attachment is still adaptive for the offspring, attachment disorganization is characterized by a breakdown of adaptive strategies (Main and Solomon 1986, 1990). This may be reflected in a variety of ways, for example, by dissociation, disorientation, fear, or lack of emotion control when socially distressed. Disorganized attachment may develop in response to abusive, negligent, or frightening behavior of the caregiver or in response to loss of, and separation from, that person. In fact, most of children with disorganized attachment representations display vestigial adaptive tactics, such as developing a role-reversed or controlling relationship with the caregiver (Main and Cassidy 1988; Moss, Cyr and Dubois-Comtois 2004). Insecure and in particular disorganized attachment are considered risk factors for socio-emotional and cognitive development (Strauss, Buchheim and Kächele 2002), while secure attachment is known as a potent protective factor (Werner and Smith 1982).

Attachment representations developed with the primary caregivers are generally transmitted to further relationships with other humans (Bowlby 1969; Sroufe and Fleeson 1988; Howes and Hamilton 1992; Dozier et al. 2001; Sroufe et al. 2005), including teachers (Howe 2003; Aschauer 2006; Achatz 2007). In fact, insecure-avoidantly attached children generally neither expect nor solicit emotional care from their teachers. They try to avoid rejection by withdrawing or by ignoring the teacher's efforts to establish contact (Julius, Gasteiger-Klicpera and Kissgen 2009). Children with disorganized attachment often display either punitive-controlling or caregiving-controlling behaviors toward their parents and also toward their teachers or therapists (Motti 1986; Julius, Gasteiger-Klicpera and Kissgen 2009). They do this to try to reduce their anxiety, because they generally expect that attachment figures are either dangerous or neglectful, or that there is the possibility of losing them again (Julius et al. 2013).

Interestingly, previous studies suggest that transmission of primary attachment representations acquired with humans does not seem to occur toward companion animals. Children often turn to their animals for social support in emotionally stressful situations (Rost and

Hartmann 1994; McNicholas and Collis 2006). They generally maintain a trusting relationship with their companion animals (Kurdek 2008, 2009a,b; Beetz et al. 2011), which therefore may play an important buffering role in their development (Beetz et al. 2012b). Even children with insecure attachment are able to trust companion animals (Kurdek 2008, 2009a,b).

We previously showed (Beetz et al. 2011; 2012a) that the interaction with a real dog, rather than with a toy dog or with a friendly student, was associated with lower salivary cortisol levels during a socially stressful situation. The more these children had body contact with the dog, the lower were their cortisol levels after the stressful episode. Hence, the efficiency of the dog as an emotional social supporter was clearly related to the contact-seeking behavior of the child. This kind of response is indicative of the activation of the oxytocin system by being close to, and in physical contact with, the dog. We hypothesized that the inhibition of the cortisol cascade by oxytocin was at least partly the cause of this effect (Beetz et al. 2012a; Julius, Beetz and Kotrschal 2013; Julius et al. 2013).

In the present study we asked whether and how male children with insecure-avoidant or disorganized attachment representation differ in behavior, interactions, and physiological responses in a stressful situation while being "supported" by an unfamiliar therapy dog. According to previous evidence (Kurdek 2008) and in alignment with the assumption that attachment representations will not be transferred from humans to animals (Julius et al. 2013), there should be no differences in interactions toward the dog as related to the attachment representations of the children. In contrast, such differences should show in the interaction of these children with humans. However, some practical experience suggests otherwise, namely that avoidant tendencies can also be observed in human–animal interactions, reflecting a persistent social interaction style. We therefore hypothesized that parts of the IWM (the primary attachment representation formed in interaction with the primary caregiver) will be transferred to companion animals. In particular we expected that insecure-avoidant children would avoid contact with the dog more or seek contact less than children with disorganized attachment, during a socially stressful situation. In reverse, disorganized children were expected to show more interactions and physical contact with the dog than avoidant children. We expected that the amount of contact with a friendly dog would be in line with the behaviors to be expected in accordance with the children's IWM.

Methods

To test whether the contact-seeking behavior toward the dog would be in alignment with the IWMs of the children participating in our study, we exposed children with insecure or disorganized attachment to the Trier Social Stress Test for Children, a standardized social stressor (Kirschbaum, Pirke and Hellhammer 1993) and allowed them to freely interact with a dog during the entire procedure. To judge the effects on the hypothalamic-pituitary axis as related to the children's attachment style, cortisol levels were determined from saliva samples. Furthermore, the behavior of the children was recorded on videotape and coded.

In this paper, we deal with an unpublished subset of results from a study which was already described in detail in two previous papers dealing with the stress reactions and behavior of male children, either supported by a real dog (our current subsample, which were supported by an unfamiliar therapy dog, and another sample which was supported by a school dog), a friendly human, or a plush toy dog (always in presence of a human investigator) (Beetz et al. 2011, 2012a). Here we report the results of the behavioral and physiological analysis to investigate whether the children's attachment pattern to humans is reflected in their interactions

with a dog, and their stress response to the test. For a full description of the technical details, please see Beetz et al. (2011, 2012a).

Participants

Data from 19 boys (7–11 years old) in Germany were analyzed. Via an attachment test (Separation Anxiety Test, see below), eight boys were classified as insecure-avoidant and 11 as disorganized. Participants were approached in their school (for special education with a focus on social and emotional development).

Procedure

Children participated on a voluntary basis. Informed consent was obtained from their legal guardians and the school headmasters. The safety and wellbeing of the people and animals involved in the study was reviewed and approved by the IRB of the University of Rostock, Germany. Our study conforms to the Declaration of Helsinki for experiments on human subjects. Data were collected on two different days with one week in between. The Separation Anxiety Test (SAT) was administered during the first meeting; the Trier Social Stress Test for Children (TSST-C, Kirschbaum, Pirke and Hellhammer 1993) was conducted one week later.

The Separation Anxiety Test (SAT)

The SAT (Hansburg 1972; Klagsbrun and Bowlby 1976; Julius 2009) is a projective picture task used to assess attachment representation in children (aged 6–12 years). In the German version for male children (Julius 2009), the eight pictures show a boy who is being separated from an attachment figure for a shorter or longer period of time. The participant is asked how the child in each picture would feel, what he would think, what he would do next, and how the story would end. Transcripts of these narratives were coded for elements of secure, avoidant, ambivalent, or disorganized attachment by a reliable coder (HJ) according to the system developed by Kaplan (1987). The SAT is a validated and widely used measure in attachment research, with good inter-rater-reliability (93%, Wright, Binney and Smith 1995; 76%, Solomon and George 1999).

Trier Social Stress Test for Children (TSST-C)

Social stress was elicited via the Trier Social Stress Test for Children (TSST-C, Kirschbaum, Pirke and Hellhammer 1993). The TSST-C was conducted in a classroom of the participating school which was unfamiliar to the participants. An unfamiliar, friendly therapy dog was present before, during, and after the TSST-C, acting as a social supporter.

The TSST-C (Kirschbaum, Pirke and Hellhammer 1993) is used to induce psychosocial stress in a standardized manner by combining an uncontrollable situation with social evaluation by others (a social-evaluative threat; Dickerson and Kemeny 2004). Such situations are not uncommon in everyday school situations.

The experiment started with an 8-minute habituation period to get acquainted with the dog, followed by a short introduction to the procedure (approx. 2 min). Thereafter, the child was given another 5 minutes to freely interact with the dog. Then the child was asked to stand in front of a committee of two unfamiliar adults (male and female) who explained that his task was to develop ideas of how a story would continue, which was subsequently told by a committee member. After the committee had left the room, the boy was given 5 minutes for preparation, before presenting his story by standing for at least 3 minutes in front of the committee and being videotaped. Then the child was asked to perform a mathematical task for 2 minutes. At the end of the test the committee gave positive feedback and a short debriefing to the child and then left. The child was led back to the other side of the room where he was left to relax for 30

minutes in free interaction with the dog. All persons (investigator, committee) were unfamiliar to the children. If a child showed significant stress or fear, the test situation was abandoned. This did not occur in the present study.

The dog was present for the entire TSST-C and the following relaxation time. All four dogs employed in this study were friendly-looking, trained therapy dogs (Jack Russel Terrier, Cavalier King Charles Spaniel, and two medium-sized, long-haired mongrels), unfamiliar to the children. These dogs were accompanied by their female dog-handler, unfamiliar to the children. The dog-handler was passively present during the experimental session in a distant corner; she was instructed to read and not to actively initiate interaction with the child. Her task was just to oversee the interactions between dog and child, and in case of being addressed by the child, to keep her answers short.

Salivary Cortisol

Over the entire session five saliva samples (t1–t5) were collected from the children via standardized salivettes® (Sarstedt; for the details of saliva sampling and cortisol analysis, see Beetz et al. 2012a). The first saliva sample (t1) was taken after the child settled down and had the first general instruction. The second sample (t2) was collected after the interaction with the dog, before the instructions for the TSST-C; the third sample was taken right after the presentation before the committee. Saliva sample 4 (t4) was taken about 12 minutes later, and sample 5 another 12 minutes later, to capture the relaxation time. Area Under the Curve increase (AUCi), a standard in stress research (Pruessner et al. 2003), was used to compare the cortisol responses (t1–t5; [nmol/L]) in boys with insecure-avoidant or disorganized attachment. AUCi indicates the increase and decrease of cortisol levels over the entire sampling time and takes into account individual differences in the initial cortisol levels of the participants (Pruessner et al. 2003). Usually, stress levels increase from t1 to t3, with a peak at t3, then decline from t3 to t5 when the child has been told (at t3) that he has done well and that he can relax.

Behavior Observation

All sessions were videotaped. These recordings were continuously behavior-coded with the aid of the software package The Observer Video Pro (version 5.0, Noldus) by two trained observers (Gabriele Sandler and Iris Schöberl). Inter-coder reliability was tested in several video sections throughout the coding process and was higher than 91% for the used variables.

For statistical analysis, some of the behavioral parameters coded were later grouped into categories. The following behavior variables were used for analysis: “physical contact with the dog” (stroking, touching, holding the dog), “playing with the dog,” “talking to the dog,” and “talking to investigator or dog-handler,” (to the investigator who tried to keep in the background, or to the dog-handler who was instructed to discourage interaction by reading, [but still be responsive to the child, if necessary]).

The percentage of the total time of the behavior variables within an interval was used for statistical analysis. Intervals considered were the period before, during, and after the TSST-C.

Mean duration of the coded interval before the TSST-C was 18.12 minutes (*SD* = 2.17; *n* = 19); of the interval during the TSST-C it was 0.38 minutes (*SD* = 1.69; *n* = 19) and of the interval after the TSST-C it was 27.18 minutes (*SD* = 4.80; *n* = 19).

Analysis

Data analysis was carried out with the aid of The Observer 5.0. (Noldus) and SPSS 15. To compare insecure-avoidant and disorganized children, Mann-Whitney *U*-tests were used. Alpha correction

for multiple comparisons was not considered because this generally increases the risk of making type-II errors (i.e., not rejecting a null hypothesis (H_0) when H_0 is false) at a comparatively low potential of reducing type-I errors (i.e., rejecting H_0 when H_0 is false) (Nakagawa 2004).

Results

Boys whose attachment was classified as disorganized actively had more physical contact (stroking, touching, holding) with the dog during the TSST-C than those with insecure-avoidant attachment (Mann-Whitney *U*: $n = 19$, $Z = -2.117$, $p = 0.034$; Table 1). However, duration of physical contact with the dog was not significantly different between the two groups for the intervals before and after the TSST-C (before TSST-C: $Z = -1.156$, $p = 0.248$; after TSST-C: $Z = -0.908$, $p = 0.364$; see Table 1).

Boys with disorganized attachment talked more to the dog during and after the TSST-C than did those with insecure-avoidant attachment (during TSST-C: $Z = -2.402$, $p = 0.016$; after TSST-C: $Z = -2.482$, $p = 0.013$; Table 1). There was no significant difference in talking to the dog before the TSST-C ($Z = -0.249$, $p = 0.804$; Table 1).

Before the stressful situation, boys with disorganized attachment talked more to the persons in the room than did those with insecure-avoidant attachment (before TSST-C: $Z = -2.725$, $p = 0.006$; Table 1). There was no significant difference in talking to these persons during and after the TSST-C (during TSST-C: $Z = -0.495$, $p = 0.620$; after TSST-C: $Z = -0.826$, $p = 0.409$; Table 1).

Disorganized and avoidant boys did not significantly differ in engagement in play with the dog before, during, or after the TSST-C (before TSST-C: $Z = -0.455$, $p = 0.649$; after TSST-C: $Z = -1.174$, $p = 0.240$; playing with the dog did not occur at all during the TSST-C, i.e., instruction, presentation of story ending and calculation; Table 1).

No significant differences between boys with insecure-avoidant and disorganized attachment were found with respect to salivary cortisol levels (nmol/L; t1: $n = 17$, $Z = -0.770$,

Table 1. Mean duration of behavioral variables per child before, during, and after the stressful situation [Percentage of total time within interval (before, during and after the TSST-C)] per groupings of children according to attachment classification ($n = 19$; mean and standard deviation; significant differences shown in bold).

Behaviors	Interval	Avoidant		Disorganized		Total	
		Mean	*SD*	Mean	*SD*	Mean	*SD*
Physical Contact with Dog	Before TSST-C	26.07	25.37	34.28	16.59	30.82	20.51
	During TSST-C	**0.35**	**0.71**	**2.25**	**3.88**	**1.45**	**3.08**
	After TSST-C	25.77	24.87	15.56	17.48	19.86	20.91
Playing with Dog	Before TSST-C	2.02	5.71	3.92	8.73	3.12	7.48
	During TSST-C	0.00	0.00	0.00	0.00	0.00	0.00
	After TSST-C	25.86	30.26	42.82	28.74	35.68	29.82
Talking to Dog	Before TSST-C	6.21	12.58	1.61	1.91	3.55	8.31
	During TSST-C	**0.00**	**0.00**	**2.70**	**4.34**	**1.57**	**3.51**
	After TSST-C	**5.07**	**7.88**	**21.55**	**15.19**	**14.61**	**14.91**
Talking to Investigator or Dog Handler	Before TSST-C	**2.21**	**2.38**	**8.54**	**5.83**	**5.88**	**5.61**
	During TSST-C	45.40	19.12	48.54	21.95	47.22	20.31
	After TSST-C	9.47	8.74	11.23	6.31	10.48	7.25

TSST-C = Trier Social Stress Test for Children.

Table 2. Mean salivary cortisol levels (nmol/L; Salivettes at t1–t5) and AUCi per groupings of children according to attachment classification (mean and standard deviation; no significant differences were found).

Cortisol	Avoidant			Disorganized			Total		
	n	Mean	*SD*	*n*	Mean	*SD*	*n*	Mean	*SD*
Salivette t1 (–10)	8	7.27	7.48	9	4.51	1.59	17	5.81	5.27
Salivette t2 (–1)	8	6.88	2.96	11	9.06	13.23	19	8.14	10.09
Salivette t3 (+1)	8	14.23	16.08	10	7.54	8.05	18	10.51	12.34
Salivette t4 (+15)	8	4.22	1.66	11	5.49	3.83	19	4.95	3.10
Salivette t5 (+30)	8	3.68	1.80	11	5.23	3.50	19	4.58	2.95
AUCi	8	43.04	491.64	8	87.62	218.80	16	65.33	368.33

AUCi = Area Under the Curve increase.

$p = 0.441$; t2: $n = 19$, $Z = –0.826$, $p = 0.409$; t3: $n = 18$, $Z = –1.067$, $p = 0.286$; t4: $n = 19$, $Z = –0.330$, $p = 0.741$; t5: $n = 19$, $Z = –1.073$, $p = 0.283$) or in respect to AUCi ($n = 16$, $Z = –0.420$, $p = 0.674$; AUCi in avoidant boys: min = –993.00, max = 667.95; AUCi in disorganized boys: min = –98.80, max = 589.90; see Table 2).

Discussion

In the present paper we investigated whether and how children with insecure-avoidant or disorganized attachment representations differ in behavior, interactions, and physiological responses during a stressful situation while "supported" by a real dog. In particular, we hypothesized that children with insecure-avoidant attachment may relate less to the therapy dog than children with insecure-disorganized attachment.

In two recent papers we showed that dogs work as social supporters in the stress regulation of male children. Boys generally interact more with a friendly dog than with a friendly human in such a setting (see Beetz et al. 2011, 2012a). We found no difference in cortisol modulation between boys with the two different attachment representations. This fits with our previous findings. However, our results contradict previous results and the popular belief that the IWM acquired with early caregivers would not be transferred to companion animals (Beck and Madresh 2008; Kurdek 2008; Julius, Beetz and Niebergall 2010). We found that, to a certain degree, an avoidant attachment representation and interaction style is also shown when interacting with an unfamiliar dog during a stressful situation. The boys with avoidant attachment interacted less with the dog during and after the TSST-C. As the previous studies relied on questionnaires to assess attachment, this contradiction can be explained. IWMs of attachment are not consciously accessible and thus not truly reportable. Also, questionnaires are known to be susceptible to social desirability, that is, that persons tend to give answers conforming to what they think is expected from them by society (or the researcher). Finally, questionnaires do not allow us to distinguish between attachment disorganization and avoidant attachment. Our behavior observations suggest that during and after a stressful situation the dog generally was more sought out for interactions by the boys with disorganized attachment than by the avoidantly attached boys. Hence, the behavioral tendencies of avoidance of social contact also affected the human–dog interaction.

For pragmatic reasons we did not compare our sample of avoidant and disorganized children with securely attached children, and also we restricted our study to boys. We are aware

that more research and bigger sample sizes are needed to investigate behavioral tendencies toward companion animals and other humans between groups of children with different attachment representations, and that this needs to include female children as well.

We conclude that against the commonly held belief that attachment representations acquired with humans are generally not transferred to companion animals, our data indicate otherwise: some components of the interaction strategies acquired with the primary caregivers and represented in the IWM may be transferred to animal partners as well.

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References

Achatz, A. 2007. Transmission von Bindungsmodellen bei Eltern-Kind- und Lehrer-Schüler-Beziehungen [Transmission of attachment models in parent–child and teacher–pupil relationships]. Ph.D. thesis. University of Vienna, Austria.

Ainsworth, M. D. S., Bell, S. M. and Stayton, D. J. 1971. Individual differences in strange-situation behavior of one-year-olds. In *The Origins Of Human Social Relations*, 17–52, ed. H. R. Schaffer. New York: Academic Press.

Ainsworth, M. D. S., Blehar, M. C., Waters, E. and Wall, S. 1978. *Patterns of Attachment: A Psychological Study of the Strange Situation*. Hillsdale, NY: Erlenbaum.

Ainsworth, M. D. S. and Wittig, B. A. 1969. Attachment and the exploratory behavior of one-year-olds in a strange situation. In *Determinants of Infant Behaviour*, 111–136, ed. B. M. Foss. London: Methuen.

Aschauer, S. 2006. Findet eine Transmission der Eltern-Kind-Beziehung auf die Lehrer-Schüler-Beziehung statt? [Is the parent–child relationship transferred to the teacher–pupil relationship?]. Master's thesis. University of Vienna, Austria.

Beck, L. and Madresh, E. A. 2008. Romantic and four-legged friends: An extension of attachment theory to relationships with pets. *Anthrozoös* 21: 43–56.

Beetz, A., Julius, H., Turner, D. and Kotrschal K. 2012a. Effects of social support by a dog on stress modulation in male children with insecure attachment. *Frontiers in Educational Psychology* 3: 1–9.

Beetz, A., Kotrschal, K., Turner, D., Hediger, K., Uvnäs-Moberg, K. and Julius, H. 2011. The effect of a real dog, toy dog and friendly person on insecurely attached children in a stressful task: An exploratory study. *Anthrozoös* 24: 349–368.

Beetz, A., Uvnäs-Moberg, K., Julius, H. and Kotrschal, K. 2012b. Psychosocial and psychophysiological effects of human–animal interactions: The possible role of oxytocin. *Frontiers in Psychology* 3: 1–15.

Bowlby, J. 1958. The nature of the child's tie to his mother. *International Journal of Psychoanalysis* 39: 350–373.

Bowlby, J. 1969. *Attachment and Loss, Vol. 1: Attachment*. New York: Basic Books.

Bowlby, J. 1972. *Attachment.* Middlesex: Penguin Books.

Bowlby, J. 1973. *Attachment and Loss. Vol. 2: Separation: Anxiety and Anger*. London: Hogarth Press.

Bretherton, I. 1985. Attachment theory: Retrospect and prospect. *Monographs of the Society for Research in Child Development* 50 (1–2): 3–35.

Cassidy, J. 1986. The ability to negotiate the environment: An aspect of infant competence as related to quality of attachment. *Child Development* 57: 331–337.

Dickerson, S. S. and Kemeny, M. E. 2004. Acute stressors and cortisol responses: A theoretical integration and synthesis of laboratory research. *Psychological Bulletin* 130: 355–391.

Dozier, M., Stovall, K. C., Albus, K. E. and Bates, B. 2001. Attachment for infants in foster care: The role of caregiver state of mind. *Child Development* 72: 1467–1477.

Hansburg, H. G. 1972. *Adolescent Separation Anxiety: A Method for the Study of Adolescent Separation Problems.* Springfield, IL: Charles C. Thomas.

Howe, D. 2003. Attachment disorders: Disinhibited attachment behaviours and secure base distortions with special reference to adopted children. *Attachment & Human Development* 5: 265–270.

Howes, C. and Hamilton, C. E. 1992. Children's relationships with childcare teachers: Stability and concordance with parental attachments. *Child Development* 63: 867–878.

Julius, H. 2009. Diagnostik der Bindungsqualität im Grundschulalter - Der Separation Anxiety Test (SAT). In *Bindung im Kindesalter*, 121–137, ed. H. Julius, B. Gasteiger-Klicpera, and R. Kissgen. Göttingen: Hogrefe.

Julius, H., Beetz, A. and Kotrschal, K. 2013. Psychologische und physiologische Effekte einer tiergestützten Intervention bei unsicher und desorganisiert gebundenen Kindern. *Empirische Sonderpädagogik* 2: 160–166.

Julius, H., Beetz, A., Kotrschal, K., Turner, D. and Uvnäs-Moberg, K. 2013. *Attachment to Pets. An Integrative View of Human–Animal Relationships with Implications for Therapeutic Practice*. Cambridge, MA: Hogrefe.

Julius, H., Beetz, A. and Niebergall, K. 2010. Breaking the transmisson cycle of insecure and desorganized attachment. Paper presented at the 12th International IAHAIO Conference on Human–Animal Interactions "People & Animals: For Life," Stockholm, Sweden, July 1–4, 2010.

Julius, H., Gasteiger-Klicpera, B. and Kissgen, R. eds. 2009. *Bindung im Kindesalter. Diagnostik und Intervention.* Göttingen: Hogrefe.

Kaplan, N. 1987. Individual differences in six-year-olds' thoughts about separation: Predicted from attachment to mother at age one. Unpublished doctoral dissertation, University of California, Berkeley, USA.

Kirschbaum, C., Pirke, K. M. and Hellhammer, D. H. 1993. The "Trier Social Stress Test"—a tool for investigating psychobiology stress responses in a laboratory setting. *Neuropsychobiology* 28: 76–81.

Klagsbrun, M. and Bowlby, J. 1976. Responses to separation from parents: A clinical test for young children. *British Journal of Projective Psychology* 21: 7–21.

Kurdek, L. A. 2008. Pet dogs as attachment figures. *Journal of Social and Personal Relationships* 25: 247–266.

Kurdek, L. A. 2009a. Pet dogs as attachment figures for adult owners. *Journal of Family Psychology* 23: 439–446.

Kurdek, L. A. 2009b. Young adults' attachment to pet dogs: Findings from open-ended methods. *Anthrozoös* 22: 359–369.

Main, M. and Cassidy, J. 1988. Categories of response to reunion with the parent at age 6: Predictable from infant attachment classifications and stable over a 1-month period. *Developmental Psychology* 24: 415–426.

Main, M., Kaplan, N. and Cassidy, J. 1985. Security in infancy, childhood, and adulthood: A move to the level of representation. In *Growing Points in Attachment Theory and Research. Monographs of the Society for Research in Child Development,* 50, 66–106, ed. I. Bretherton and E. Waters. New Jersey: Wiley.

Main, M. and Solomon, J. 1986. Discovery of an insecure disorganized/disoriented attachment pattern: Procedures, findings and implications for the classification of behavior. In *Affective Development in Infancy,* 95–124, ed. T. Braxelton and M. Yogman. Norwood, NJ: Ablex Publishing Corporation.

Main, M. and Solomon, J. 1990. Procedures for identifying infants as disorganized/disoriented during the Ainsworth Strange Situation. In *Attachment in Preschool Years*, 121–160, ed. M. T. Greenberg, D. Cicchetti and E. M. Cummings. Chicago: University of Chicago Press.

Matas, L., Arend, R. A. and Sroufe, L. A. 1978. Continuity of adaptation in the second year: The relationship between quality of attachment and later competence. *Child Development* 49: 547–556.

McNicholas, J. and Collis, G. M. 2006. Animals as social supports: Insights for understanding animal-assisted therapy. In *Handbook on Animal-Assisted Therapy*. 2nd edn, 49–71, ed. A. H. Fine. San Diego: Elsevier.

Moss, E., Cyr, C. and Dubois-Comtois, K. 2004. Attachment at early school age and developmental risk: Examining trajectories of controlling–caregiving, controlling–punitive and behaviorally-disorganized children. *Developmental Psychology* 40: 519–532.

Motti, F. 1986. Relationships of preschool teachers with children of varying developmental histories. Ph.D. thesis, University of Minnesota, Minneapolis, MN, USA.

Nakagawa, S. 2004. A farewell to Bonferroni: The problems of low statistical power and publication bias. *Behavioural Ecology* 15: 1044–1045.

Pruessner, J. C., Kirschbaum, C., Meinlschmid, G. and Hellhammer, D. H. 2003. Two formulas for computation of the area under the curve represent measures of total hormone concentration versus time dependent change. *Psychoneuroendocrinology* 28: 916–931.

Rost, D. H. and Hartmann, A. 1994. Children and their pets. *Anthrozoös* 7: 242–254.

Solomon, J. and George, C. C. eds. 1999. *Attachment Disorganization*. New York: The Guilford Press.

Sroufe, L. A., Egeland, B., Carlson, E. A. and Collins, W. A. eds. 2005. *The Development of the Person. The Minnesota Study of Risk and Adaptation from Birth to Adulthood.* New York: The Guilford Press.

Sroufe, L. A. and Fleeson, J. 1988. The coherence of family relationships. In *Relationships within Families: Mutual Influences*, 27–47, ed. R. A. Hinde and J. Stevenson-Hinde. Oxford: Oxford University Press.

Steele, M., Steele, H. and Johansson, M. 2002. Maternal predictors of children's social cognition: An attachment perspective. *Journal of Child Psychology and Psychiatry* 43: 861–872.

Strauss, B., Buchheim, A. and Kächele, H. eds. 2002. *Klinische Bindungsforschung: Theorien–Methoden–Ergebnisse.* Stuttgart: Schattauer Verlag.

Vaughn, B. E. and Waters, E. 1990. Attachment behavior at home and in the laboratory: Q-sort observations and Strange Situation classifications of one-year-olds. *Child Development* 61: 1965–1973.

Werner, E. E. and Smith, R. S. eds. 1982. *Vulnerable but Invincible: A Longitudinal Study of Resilient Children and Youth*. New York: McGraw-Hill.

Wright, J. C., Binney, V. and Smith, P. K. 1995. Security of attachment in 8–12 year olds: A revised version of the separation anxiety test, its psychometric properties and clinical interpretation. *Journal of Child Psychology and Psychiatry* 36: 757–774.