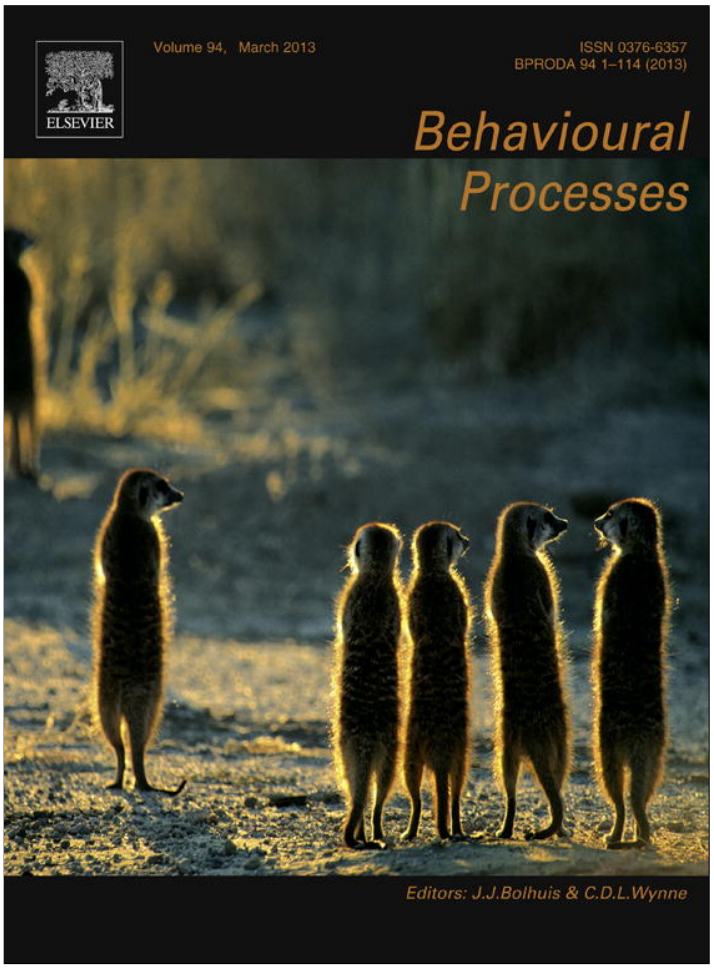

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The human and animal baby schema effect: Correlates of individual differences

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ABSTRACT

We investigated the animal and human baby schema effect (BSE) in relation to gender, parental status, and individual features. In three, independent online surveys, conducted during three consecutive years, (N_{total} = 1389), ratings of photographs of human and animal infants as well as of adults, sociodemographic variables (age, gender, parental status) and personality attributes (empathy, attachment, interpersonal closeness, narcissism, and need to belong) were assessed. We demonstrated that humans are sensitive to the baby schemata of both humans and animals and that both are weakly positively correlated. BSE is positively associated with female gender and (affective) empathy. Higher interpersonal closeness and need to belong were additionally connected specifically to the human BSE. In contrast, narcissism and insecure attachment were not related to the BSE, suggesting a robustness of this phenomenon to possible negative influences of these two personality attributes.

1. Introduction

Babies and children have specific infantile appearance features that serve as innate releasing mechanisms in adults to protect and nurture them; this is known as the baby schema effect (BSE) or *Kindchenschema* (Lorenz, 1943). These features include a large forehead, huge eyes, plump cheeks, and a chubby body with short limbs. The baby schema effect is rooted in human evolution since these characteristics promote positive emotions, endearment, (Alley, 1981; Sternglanz et al., 1977), caretaking behavior in adult parents and non-parents (Glocker et al., 2008), and inhibit aggression, thereby increasing chances of survival of babies and young children. However, this also implies that the genes of adults who are sensitive to this effect are more likely to be forwarded to next generations.

Interestingly, the BSE has not only been demonstrated for human babies. Infant animals (in particular mammals and birds) share these baby schema characteristics with human infants and consequently also elicit BSE in human adults (Gould, 1980; Lorenz, 1943). Although the available empirical evidence is limited at best (e.g., Fullard and Reiling, 1976; Sanefuij et al., 2007), the commercial success of stuffed animals and cartoon figures specifically meeting the above mentioned, baby-like features (e.g. teddy bears, Bambi, Mickey Mouse, Calimero, etc.) seem to suggest that BSE exists for animals too (Gould, 1980). Even visual product designs sharing these specific features have a major impact on the affective responses (Miesler et al., 2011). In addition, both adults and children generally rate the pictures of infant animals as cuter than those of older ones (Sanefuij et al., 2007) and pictures of both juvenile animals and humans are preferred over pictures of adults (Fullard and Reiling, 1976).

Whereas the purpose of the human BSE (elicitation of proximity, caretaking, and protection behaviors from adults, resulting in increased likelihood that one's genes are forwarded to a next generation) is highly adaptive for adults to ensure survival of the next generation, it is unclear why and to what extent animals also evoke BSE and if both effects are interrelated. In addition, there are no studies focusing on individual differences in BSE, except for those examining the influence of gender, parenthood, and age.

For example, Lorenz (1943) implicitly talked about "female behaviors", but do men and women indeed differ in this respect? Previous studies have corroborated that women are more sensitive to BSE than men (Berman, 1980; Fullard and Reiling, 1976; Glocker et al., 2008; Hildebrandt and Fitzgerald, 1978; Maestripieri and Pelka, 2002; Sprengelmeyer et al., 2009). In addition, there is evidence that women are more "tender-minded" and have more positive attitudes toward animals (Furnham et al., 2003; Serpell, 2004). However, occasionally failures to demonstrate gender differences have been reported (Brosch et al., 2007; Sherman et al., 2009). A recent study further demonstrated that finding gender differences may be dependent on the operationalization of the measures (Parsons et al., 2011). More precisely, although women gave significantly higher 'liking' ratings for infant faces (but not adult faces) than men, both genders did not differ when measuring the willingness to key-press to increase or decrease viewing duration of an infant face. Earlier research on the reactions to infant crying (Seifritz et al., 2003) demonstrated differential brain reactions in the amygdala and interconnected limbic

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structures of parents vs. non-parents, but we are not aware of any studies comparing parents and non-parents with respect to BSE. Finally, there are some studies (e.g., Sanefuij et al., 2007), which showed that young children also have preferences for (animal) baby faces, although Fullard and Reiling (1976) reported a strong increase of this phenomenon, especially for girls, between grades 6 and 8.

Interestingly, recent research has provided support that tenderness, elicited by cute images, is more than just a state of positive feelings. For example, it has been demonstrated that baby schema stimuli also activated a certain brain structure, mediating reward processing and approach motivation (Glocker et al., 2009). In addition, exposure to images of cute animals and babies made people more physically tender in their motor behavior (Nittono et al., 2012; Sherman et al., 2009). People thus seem to behave more deliberately and perform tasks with greater accuracy (i.e. time and care) after exposure to baby images. This also extends to the perceptual domain, where there is a narrowing of attention, which might be beneficial to performance on tasks that require certain carefulness (Nittono et al., 2012). Finally, there is suggestive evidence that cuteness is a determinant of adoption preferences (Volk and Quinsey, 2002) and an observational study among mothers feeding and playing with their newborns in the hospital revealed that mothers of attractive infants were more playful and affectionate than mothers of less attractive infants (Langlois et al., 1995).

To date, no studies have investigated the relationship between BSE and personality features. Nevertheless, if BSE sensitivity is an evolved trait, it is of interest to know more about other personality characteristic with which it covaries. This is relevant, because there is increasing evidence suggesting that morality and prosocial behaviors originate from rather basic biological processes (e.g., de Waal, 2008) and that there is a gradual development of mother–child interaction, development of empathy, engagement in romantic relationships, to a more general social connectedness and moral functioning, with a key role for the hormone oxytocin (cf. Dissanayake, 2008; Rottenberg and Vingerhoets, 2012). Therefore, the present study is the first to examine the relationships between the animal and human BSE with psychological constructs connected with social functioning such as attachment style, empathy, narcissism, need to belong, and interpersonal closeness. This brings up the question if this BSE, which was ever crucial for forwarding one's genes to next generations is so robust that individual differences hardly exist, and if they exist, whether they are linked in particular to personality characteristics, closely connected not only to social and interpersonal functioning, but also to parental status. The personality constructs included in the study and their hypothesized associations with BSE will be introduced below.

Attachment styles originate in infancy, carry over into adulthood, and become an important factor explaining individual differences in social interactions and (intimate) relationships (Butzer and Campbell, 2008; Collin and Read, 1990; Hazan and Shaver, 1987; Mikulincer and Shaver, 2007). Adult attachment style is defined along two dimensions: (1) attachment-related anxiety, or the degree to which people fear rejection and (2) attachment-related avoidance which describes the degree to which people are comfortable with intimacy and dependence (Brennan et al., 1998). Given the established link between (in)secure attachment and all kind of relationship outcomes (see Mikulincer and Shaver, 2007 for an overview), it might be expected that individuals whose social interactions are inhibited by high attachment-related anxiety or avoidance will demonstrate a weaker BSE.

Empathy is another relevant factor for the establishment and maintenance of social bonds which concerns not only the ability to recognize and understand the emotions of others, but it also underpins altruism and prosocial behavior (de Waal, 1997, 2008; Singer, 2006; Watt, 2005). Consequently, we hypothesized that individuals high in empathy will demonstrate a stronger BSE. Since Taylor and Signal (2005) demonstrated that individuals with more positive attitudes toward animals also show higher human to human empathy (see however Paul, 2000), we anticipate finding a positive relationship between empathy and the human as well as animal BSE.

In addition to attachment and empathy, as solid indicators of interpersonal functioning, we also wanted to include more concrete and specific measures of social connectedness. According to Baumeister and Leary (1995), humans have a "pervasive drive to form and maintain at least a minimum quantity of lasting, positive, and significant interpersonal relationships" (p. 497). We thus hypothesize that a sense of belongingness (i.e. need to belong) may be closely associated with a higher sensitivity to the human and maybe also animal BSE.

Interpersonal closeness was chosen as a further possible correlate, since a greater sense of interpersonal interconnectedness implies being more responsive to the needs of others (Aron et al., 1992), which may be linked to a stronger BSE.

Certain other personality features, however, are known to prevent the development of healthy relationships with others. For example, a main characteristic of narcissism is the extreme self-centeredness and its negative association with empathy (Morf and Rhodewalt, 2001). We therefore hypothesize that individuals high in narcissism show a low sensitivity to cues that elicit caring behavior and, consequently, we expect to find a negative association with BSE.

With a series of three studies, we aim to thoroughly investigate the BSE of both animals and humans and their relationships with the personality features described above which have never been studied to this extent before. In study I, we investigated the existence of the animal BSE and its relation to attachment and empathy. Study II was designed to replicate study I, but extent the scope to both the animal and human BSE. In both studies, we evaluated our hypotheses concerning the relationship between attachment, empathy, gender, and parental status, on the one hand, and sensitivity toward BSE, on the other hand. In the final study, we extended the assessment of personality factors with need to belong, interpersonal closeness, and narcissism, investigating the human and animal BSE based on our hypotheses outlined above.

2. Study I

In study I, we examined the existence of the animal BSE and investigated its relation to gender and parental status, as well as attachment and empathy.

2.1. Method I

All three studies were conducted online in three consecutive years from 2008 to 2010. Participants were recruited, for each study separately, via announcements on the website of a Dutch national radio station, playing an annual six-day non-stop popular program, called TOP2000. Participation was voluntary and anonymous. The measures described here were part of more comprehensive surveys, with the focus on music, personality, and emotions.

2.1.1. Participants I

The sample included 367 participants (185 men, 182 women) in the age range of 16–66 ($M = 42.49$, $SD = 11.13$), of whom 40% had received higher education. Two hundred and thirty-seven participants (124 men, 113 women) were parents, while 130 were not (61 men, 69 women).

Fig. 1. Examples of the juvenile and adult animal pictures used in all three studies.

2.1.2. Measures I

2.1.2.1. Attachment style. The Experiences in Close Relationships-Revised (ECR-r; Fraley et al., 2000) was used to assess attachment styles. This measure consists of 36 items, rated on a 7-point Likert scale from *strongly disagree* (1) to *strongly agree* (7), of which 18 items measure attachment-related anxiety and 18 items measure attachment-related avoidance. Sibley and Liu (2004) demonstrated good temporal stability for both scales. Cronbach's α in this sample was .94 for the attachment-related avoidance dimension and .92 for the attachment-related anxiety dimension. Mean scores for each dimension were calculated, with a higher score indicating a higher level of attachment-related anxiety and avoidance, respectively.

2.1.2.2. Empathy. Empathy was evaluated with a shortened version (16 items) of the measure of emotional empathy (Mehrabian and Epstein, 1972), rated on a Likert scale ranging from 1 (*yes, this is true*) to 5 (*no, this is not true*). Sum scores of the 16 items were calculated, with a higher sum score indicating a higher level of empathy. Cronbach's α was found to be .74 in this sample.

2.1.2.3. Stimuli operationalizing the BSE. Colored photographs of seven adult animals (a cat, dog, horse, chicken, lion, elephant, and rabbit) and a corresponding juvenile version of these animals were used as stimuli (see Fig. 1 for examples). All photographs showed the animals in full body size sitting or standing in front of neutral/natural backgrounds and in the format 640 (width) $\times$ 480 (height) pixels. Participants could themselves determine the exposure time. After each picture, they were asked to rate on a scale from 1 (*not at all*) to 5 (*very much*) the following questions: "To what extent does this picture touch you emotionally?", "To what extent do you feel this is a pleasant picture?", "To what extent do you think this is a relaxing picture?", and "To what extent does this picture physically affect you?". Mean scores were computed separately for the ratings of the juvenile animals and those of the adults. We refer to these scores as evaluation scores (of the average picture ratings). As operationalization of the BSE, difference scores were calculated by subtracting the ratings of the adults from the ratings of the young animals. A positive score indicates a more positive reaction to the young animals (the animal BSE) and a negative score a more positive evaluation of the adult animals. Cronbach's α of the evaluation scores were found to be .98 (babies) and .97 (adults).

2.1.3. Statistical analyses I

We investigated the evaluation of pictures in two ways: in an absolute and relative way. For the former, we used the mean scores of the infant pictures, for the latter we used difference scores between infant and adult pictures operationalizing the BSE (therefore, data on the evaluation of adult pictures are not separately discussed, although they are included in Tables 1 and 4.

Independent *t*-tests were conducted to assess gender differences in the dependent variables (ratings of young animals and the difference scores) and independent variables (attachment-related avoidance, attachment-related anxiety, and empathy). Furthermore, a *t*-test was used to evaluate the difference between the ratings of juvenile and adult animals. Due to these multiple comparisons, we only accepted a conservative alpha-level of .001 to identify significant differences.

Subsequently, two hierarchical multiple regression analyses were performed to assess the predictive power of gender, parental status, empathy, attachment-related anxiety, attachment-related avoidance, and an anxiety by avoidance interaction for the evaluation for ratings of the infant animal pictures and difference scores. Since previous research had already demonstrated significant effects of gender, this variable was entered in the first block in the multiple regression analyses. The remaining variables were entered in the second block, together with age and parental status (being a parent yes/no). To minimize the risk of multicollinearity, the attachment-related anxiety and avoidance scores were centered before creating the interaction term. All analyses were conducted with SPSS version 18.0.

2.2. Results I

The descriptive statistics and results of the *t*-tests comparing men and women are displayed in Table 1. No gender differences were observed in the attachment style dimensions, but women were found to be significantly more empathic than men (see Table 1). The ratings of the infant animal pictures were significantly higher than the adult pictures ($t = -16.85$; $p < .001$), resulting in only positive difference scores of the picture evaluations, indicating the

Table 1
Means, standard deviations (SD), and independent *t*-tests of dependent and independent variables (of studies I and II).

	Study I				Study II			
	Whole sample $n = 367$ mean (SD)	Men $n = 185$ mean (SD)	Women $n = 182$ mean (SD)	*t*	Whole sample $n = 506$ mean (SD)	Men $n = 229$ mean (SD)	Women $n = 277$ mean (SD)	*t*
Empathy	57.2 (7.4)	51.1 (7.1)	60.4 (6.3)	−8.83**	57.7 (6.4)	55.3 (5.3)	59.7 (6.5)	−8.25**
Affective	–	–	–	–	31.0 (4.3)	29.4 (3.8)	32.2 (4.3)	−7.79**
Cognitive	–	–	–	–	26.8 (3.5)	25.9 (3.3)	27.5 (3.5)	−5.25**
ECR anxiety	2.6 (1.2)	2.6 (1.2)	2.7 (1.1)	−0.31	3.4 (1.0)	3.4 (1.0)	3.5 (1.1)	−1.11
ECR avoidance	2.7 (1.1)	2.7 (1.1)	2.7 (1.1)	0.04	2.7 (1.1)	2.7 (1.1)	2.7 (1.2)	0.15
Human baby	–	–	–		3.3 (1.0)	3.1 (1.0)	3.5 (0.9)	−4.52**
Humans adult	–	–	–		1.6 (0.5)	1.7 (0.5)	1.6 (0.5)	1.99
Infant animal	3.3 (1.0)	2.9 (1.0)	3.6 (0.8)	−7.23**	3.4 (0.8)	3.1 (0.8)	3.6 (0.8)	−6.55**
Animal adult	3.0 (0.9)	2.7 (0.9)	3.2 (0.8)	−5.77**	2.9 (0.8)	2.7 (0.8)	3.0 (0.8)	−3.11
Δ Human	–	–	–	–	1.7 (0.9)	1.4 (0.9)	1.9 (0.9)	−5.73**
Δ Animal	0.3 (0.3)	0.2 (0.3)	0.4 (0.3)	−4.99**	0.5 (0.9)	0.4 (0.6)	0.6 (0.6)	−4.60**

ΔHuman and ΔAnimal stand for the difference scores between infants and adults of humans and animals respectively.
** $\rho \leq 0.01$.

existence of the animal BSE. On average, women rated the pictures of infant and adult animals significantly higher than men and were also found to have higher difference scores than men (Table 1).

Multiple linear regression analyses revealed significant and consistent effects of gender on the ratings of the young animals and on the difference scores (see Table 2). In addition, empathy was positively related to the picture ratings of infant animals and the difference scores, whereas the two attachment dimensions were found to be non-significant (see Table 2). Interestingly, age was found to have a negative significant relation only with the difference scores. Parental status showed no significant effects.

2.3. Discussion I

With this first study we provided evidence for the existence of an animal BSE. As expected, female gender was found to predict the magnitude of the animal BSE, replicating former findings of women being more responsive toward human babies (e.g., Berman, 1980; Fullard and Reiling, 1976; Glocker et al., 2008; Hildebrandt and Fitzgerald, 1978; Maestripieri and Pelka, 2002; Sprengelmeyer et al., 2009). New is that we demonstrated that this holds for young animals too. A possible explanation for this effect could be due to women's long tradition of caregiving. Furthermore, as anticipated, higher levels of empathy were connected with a higher responsiveness toward infant animals. The regression analyses also revealed an age effect, indicating that, with increasing age, humans become *less* affected by the sight of infant animals. We can only speculate about possible underlying explanations, but maybe older people become less responsive to the animal BSE, since they do not need to serve as primary caretakers anymore. Future research should investigate this aspect more thoroughly. However, one should also notice, that the beta weights and added explained variances are rather low suggesting that other factors are probably involved. A further major question is how the animal and the human BSE are mutually related. This, among others, will be addressed in the following studies.

3. Study II

Study II was designed to replicate and extend the findings of study I by also including human baby and adult pictures. Empathy and attachment were, again, included as possible predictors of the BSE. However, we now assessed affective and cognitive empathy separately, since both aspects of empathy are distinguished clinically and neurobiologically from each other. Whereas affective empathy focuses on the capacity to sense what another individual is feeling, cognitive empathy refers to the ability to understand what

Table 2
Summary of multiple regression analyses for variables predicting ratings of infant animals and the difference scores (study I).

Variable	Infant animals		Δ Animal	
	B (SE)	ß	*B* (SE)	ß
Step 1				
Constant	2.92 (.07)		.21 (.02)	
Gender[a]	.68 (.094)	.36**	.17 (.03)	.25**
Step 2				
Constant	2.05 (.46)		−.05 (.16)	
Gender[a]	.55 (.10)	.29**	.13 (.04)	.20**
Age	−.01 (.005)	−.07	−.005 (.003)	−.16**
Parental status[b]	.02 (.12)	.01	.05 (.04)	.07
Empathy	.02 (.01)	.15**	.005 (.002)	.12*
ECR anxiety	.002 (.003)	.04	.0001 (.001)	−.004
ECR avoidance	−.001 (.003)	−.03	.002 (.001)	.09
ECR interaction	.01 (.04)	.01	.02 (.01)	.09

Evaluation infant animals: $R^2 = .13$ for step 1, $\Delta R^2 = .02$ ($p = .10$).
ΔAnimal: $R^2 = .06$ for step 1, $\Delta R^2 = .04$ ($p = .02$).
* $\rho \leq .05$.
** $\rho \leq .01$.
[a] Male = 0, Female = 1.
[b] No children = 0, one or more children = 1.

is going on in the mind of another person. We speculate that affective empathy might be more strongly related to BSE than cognitive empathy.

3.1. Method II

3.1.1. Participants II

The sample included 506 participants (229 men, 277 women) aged between 12 and 71 ($M = 44.96$, SD = 11.27), of whom 59% had received higher education. Three hundred and six (60.5%) participants were parents, while 200 had no children. Recruitment was similar to study I.

3.1.2. Measures II

3.1.2.1. Attachment style. Attachment style was assessed with the short version of the Experiences in Close Relationships (ECR; Wei et al., 2007) which consists of 12 items to measure attachment-related anxiety and attachment-related avoidance (6 items each). Average scores of the two dimensions were calculated, with higher scores indicating higher levels of attachment-related anxiety and avoidance. Cronbach's α in this sample was .70 for the attachment-related anxiety dimension and .82 for the attachment-related avoidance dimension.

3.1.2.2. Empathy. The Basic Empathy Scale (BES, Jolliffe and Farrington, 2006), was now applied, because this 20-item instrument allowed the distinction between affective (11 items) and cognitive empathy (9 items). Average scores were calculated for both subscales and Cronbach's α were found to be .74 for both subscales and .79 for the total score.

3.1.2.3. Stimuli operationalizing the BSE. Similarly as in study I, colored photographs of both young and adult animals, but also humans were used as stimuli. Participants were exposed to three infant animal (a juvenile rabbit, elephant, and horse), three human babies (in the age range of 6–12 months), three adult animals (full grown dog, horse, and lion), and four human adults (see also Figs. 1 and 2). All pictures presented a close-up on a neutral background in the standardized format of 640 × 480 pixels. We counterbalanced gender for the human adult pictures choosing for two male and two female pictures with a neutral facial expression. Participants were again allowed to watch the pictures as long as they wanted. After each picture, participants were requested to rate the pictures on a scale from 1 (*not at all*) to 5 (*very much*). The questions were: "To what extent does this picture touch you emotionally?", "To what extent do you think this is a pleasant picture?", "To what extent do you think this is a charming/endearing picture?", and "To what extent is this picture pleasant to look at?". Mean scores of these four questions were computed for young and adult animals and humans separately representing the general evaluation scales of these four different types of pictures. Cronbach's α of the four picture evaluation scales were found to range from .91 (human adults), .92 (adult animals), .94 (infant animals) to .96 (human babies). Again, we computed difference scores, with positive scores indicating a more positive rating of the infants.

3.1.3. Statistical analyses II

We followed the same statistical analysis strategies as in study I. Again, we only present the results of the evaluation of the baby pictures (absolute scores) and the differences scores, operationalizing the BSE. We additionally calculated the bivariate correlations between the human baby and infant animal evaluation scores as well as the relation between the human and animal difference scores.

3.2. Results II

Descriptive statistics for all variables of this study are presented in Table 1. Similar as observed in study I, men and women did not differ in their reported attachment styles, whereas their empathy scores differed significantly, with women scoring higher on both subscales of the BES and on the total score. The average difference was higher for affective than for cognitive empathy. The human baby pictures were significantly rated more positively than the human adult pictures ($t = 40.68$, $p < .001$) and the same pattern was found for the animal pictures ($t = 19.53$, $p < .001$). Hence, the difference scores were also consistently positive. Correlational analyses showed that the ratings of the human babies and infant animals were moderately associated ($r = .54$; $p < .0001$), while the human and animal difference scores were only weakly associated with $r = .20$ ($p < .0001$). Gender emerged as a predictor in every multiple regression analysis indicating that women rated all pictures more positively than men. Affective empathy also turned out to be a significant predictor in these regression analyses (except in case

Fig. 2. Examples of the baby and adult human pictures used in studies II and III.

Table 3
Summary of multiple regression analyses for the four positive arousal scales and their difference scores for humans and animals (study II).

Variable	Human babies		Infant animals		Δ Human		Δ Animal	
	B (SE)	*β*	*B* (SE)	*β*	*B* (SE)	*β*	*B* (SE)	*β*
Step 1								
Constant	3.13 (.06)		3.14 (.05)		1.45 (.06)		.40 (.04)	
Gender[a]	.38 (.08)	.20**	.46 (.07)	.28**	.47 (.08)	.25**	.24 (.05)	.20**
Step 2								
Constant	1.14 (.45)		1.57 (.39)		.31 (.44)		.001 (.30)	
Gender[a]	.26 (.09)	.14**	.37 (.07)	.22**	.34 (.08)	.18**	.20 (.06)	.16**
Age	.01 (.004)	.08	.005 (.004)	.07	−.01 (.004)	−.08	−.003 (.003)	−.06
Parental status[b]	.35 (.09)	.18**	.07 (.08)	.04	.41 (.09)	.23**	.20 (.06)	.16**
Empathy								
Affective	.04 (.01)	.19**	.03 (.01)	.14**	.03 (.01)	.16**	.01 (.01)	.07
Cognitive	.003 (.01)	.01	.02 (.01)	.07	.01 (.01)	.02	.003 (.01)	.01
ECR-anxiety	.09 (.04)	.10	.07 (.04)	.09	.07 (.04)	.08	.01 (.03)	.01
ECR-avoidance	−.07 (.04)	−.08	−.05 (.03)	−.07	−.08 (.04)	−.09*	.01 (.02)	.01
ECR interaction	−.03 (.03)	−.03	.01 (.03)	.02	−.02 (.03)	−.02	.04 (.02)	.08

Scale human babies: $R^2 = .04$ step 1; $\Delta R^2 = .10$ ($p < .0001$).
Scale infant animals: $R^2 = .08$ step 1; $\Delta R^2 = .05$ ($p = .001$).
ΔHuman: $R^2 = .06$ step 1; $\Delta R^2 = .09$ ($p < .0001$).
ΔAnimal: $R^2 = .04$ step 1; $\Delta R^2 = .03$ ($p = .02$).
ΔHuman and ΔAnimal stand for the difference scores between infants and adults of humans and animals respectively.
* $\rho \leq .05$.
** $\rho \leq .01$.
[a] Male = 0, Female = 1.
[b] No children = 0, one or more children = 1.

of the animal difference scores), while cognitive empathy never reached statistical significance (see also Table 3). Parental status had an impact on the ratings of both human and animal pictures, implying that study participants with at least one child provided more positive ratings for both humans and animals. Finally, the attachment dimension avoidance emerged as a negative predictor of the human BSE (Table 3).

3.3. Discussion II

Study II replicated the main findings obtained in study I, by identifying gender and empathy as consistent and strong correlates of BSE. However, in this study we could extend the scope from animals to humans and we demonstrated that it is in particular the affective, rather than the cognitive, dimension of empathy that is related to the human BSE. Furthermore, parental status was associated with the more positive evaluation of human pictures, suggesting that parents are more prone to the human BSE. This seems obvious because individuals who give or have given care to their own infant(s) may also become more prone to provide care to offspring of others. Or, the other way around, individuals reacting more positively to babies may also be more likely become parents. Earlier, we also addressed the differential brain reactions of parents and nonparents to infant crying (Seifritz et al., 2003), suggesting that parental status influences one's tendency to respond to infants. Additionally, parental status turned out as a significant predictor in the animal difference score which we interpret as a carry-over effect. Parents are care providers and therefore may respond more positively to (young) animals, for example, because of the influence of typical caregiving and parenting, but also bonding hormones like oxytocin (Heinrichs and Domes, 2008). Alternatively, it may be speculated that parents, especially with younger children, are maybe more likely to have pets, which may explain this result (Melson, 2003).

The negative association of the attachment-related avoidance dimension with the human difference scores is weak, but nevertheless yields an interesting insight: Individuals who are more reluctant to approach others and feel uncomfortable in the company of others will be less likely to positively evaluate and react to infants. Interestingly, explained variances of the regression models were again rather low in the models for animals, but considerably larger for the human pictures suggesting that personality correlates may be more influential in the human than animal BSE. The following study was designed to evaluate additional personality constructs.

4. Study III

After having examined the role of attachment and empathy in BSE, this final study focused on other personality measures to obtain a better understanding of the relationships of BSE and more general social functioning: narcissism, interpersonal closeness, and need to belong. We anticipate a negative relationship with narcissism, whereas interpersonal closeness and need to belong will more likely show a positive association.

4.1. Method III

4.1.1. Participants III

The sample included 516 Dutch participants (250 men, 266 women) aged 10–64 years ($M = 40.16$; $SD = 12.58$). Recruitment once more took place during the radio show Top2000.

4.1.2. Measures III

4.1.2.1. Interpersonal closeness. The Inclusion of Other in the Self Scale (IOS; Aron et al., 1992; Schubert and Otten, 2002) was used to measure interpersonal closeness. This one-item measure consists of a pictorial representation of seven circle pairs (labeled as "self" and "others") with different degrees of overlap. The pairs increase in their degree of overlap meaning that higher scores indicate more interpersonal closeness. Participants had to choose the pair that best represents how they see themselves being connected to others.

4.1.2.2. Narcissism. The Narcissistic Personality Inventory (NPI-16; Ames et al., 2006) contains 16 items with two statements each. Participants had to choose for each item pair the statement that suited them best. Those statements representing narcissistic characteristics were scored with a 1 while the other statement was scored

Table 4
Means, standard deviations (SD), and independent *t*-tests of dependent and independent variables in study III.

	Study III			
	Whole sample $n = 516$ mean (SD)	Men $n = 250$ mean (SD)	Women $n = 266$ mean (SD)	t[a]
Interpersonal closeness	4.4 (1.5)	4.2 (1.5)	4.6 (1.5)	−2.60
Narcissism	4.6 (2.9)	5.1 (3.1)	4.1 (2.6)	3.95**
Need to belong	3.1 (0.7)	3.0 (0.7)	3.2 (0.6)	−3.63**
Human baby	2.8 (1.0)	2.4 (0.9)	3.1 (0.9)	−8.58**
Human adult	1.5 (0.6)	1.5 (0.5)	1.6 (0.6)	
Infant animal	2.9 (1.0)	2.4 (0.8)	3.3 (0.9)	−11.92**
Animal adult	2.6 (0.9)	2.2 (0.8)	2.9 (0.9)	
ΔHuman	1.2 (0.9)	0.9 (0.8)	1.5 (0.9)	−8.62**
ΔAnimal	0.3 (0.6)	0.2 (0.5)	0.4 (0.6)	−6.13**

ΔHuman and ΔAnimal stand for the difference scores between infants and adults (for humans and animals respectively).
** $\rho \leq 0.01$.
[a] *t*-test comparing men and women.

with a 0 for each of the 16 items. Subsequently, sum scores were calculated with higher scores indicating higher levels of narcissism. Cronbach's α was .69 in this sample.

4.1.2.3. Need to belong. The Need to Belong Scale (NTB; Leary et al., 2007) consists of 10 items, asking to what extent people want to be accepted by others, avoid being alone, avoid being rejected by others, etc. The items have to be rated on a 5-point Likert scale from *strongly disagree* (1) to *strongly agree* (5) and mean scores were calculated with higher scores indicating a higher level of need to belong. Cronbach's α was found to be .80.

4.1.2.4. Stimuli operationalizing the BSE. Participants were exposed to the same pictures as in study II, with the same rating scales. Cronbach's α of the picture evaluation scores were .93 (adult animals), .94 (human adults), .94 (human babies), and .95 (infant animals).

4.1.3. Statistical analyses III

The same statistical analyses were performed as in the previous studies. Again, results are only reported for the baby/infant animal ratings and difference scores (BSE).

4.2. Results III

Descriptive statistics of the dependent and independent variables are summarized in Table 4. Significant gender differences were found for almost every independent variable: women obtained significantly higher scores on need to belong. Men, on the other hand, scored significantly higher on narcissism, while the differences on interpersonal closeness did not reach our conservative level of $p < .001$ for multiple testing (Table 4). Consistent gender differences also emerged regarding the ratings of the human and animal pictures with women scoring more positively on each evaluation scale. Regardless of gender, the baby/infant pictures were again rated more positively than the adult pictures for both humans ($t = 29.08$, $p < .001$) and animals ($t = 12.02$, $p < .001$). The evaluations of human babies and infant animals were substantially associated ($r = .60$, $p < .0001$) while the correlation between the human and animal BSE was also positive, but weaker ($r = .33$, $p < .0001$).

Once more, the multiple linear regressions revealed gender to be a significant predictor for all picture evaluations. Interpersonal closeness predicted the evaluation of both the human baby pictures and human difference scores, but not the ratings of the animal pictures (see also Table 5). On the other hand, need to belong was positively associated with the human and animal difference scores, thus the BSE. Narcissism, in contrast, failed to predict any of the dependent variables.

4.3. Discussion III

With this final study we replicated that women show a stronger human and animal BSE than men. Moreover, we identified further correlates of the BSE. More specifically, we found higher interpersonal closeness to be exclusively connected with a stronger human BSE, while need to belong was not only positively associated with the ratings of human pictures, but also with the animal BSE. As

Table 5
Summary of multiple regression analyses for the four positive arousal scales and their difference scores for humans and animals (study III).

Variable	Human babies		Infant animals		ΔHuman		ΔAnimal	
	B (SE)	β	B (SE)	β	B (SE)	β	B (SE)	β
Step 1								
Constant	2.39 (.06)		2.38 (.05)		.87 (.05)		.15 (.03)	
Gender	.69 (.08)	.35**	.91 (.08)	.46**	.65 (.08)	.35**	.29 (.05)	.26**
Step 2								
Constant	.99 (.27)		2.02 (.27)		−.18 (.26)		−.08 (.17)	
Gender	.60 (.08)	.31**	.86 (.08)	.44**	.55 (.07)	.30**	.25 (.05)	.22**
Age	.005 (.003)	.07	.001 (.003)	−.002	.001 (.003)	−.01	−.003 (.002)	−.06
Interpersonal closeness	.14 (.03)	.21**	.05 (.03)	.07	.15 (.02)	.24**	.01 (.02)	.03
Narcissism	−.01 (.01)	−.04	−.02 (.01)	−.05	−.01 (.01)	−.04	−.003 (.01)	−.02
Need to belong	.22 (.06)	.15**	.08 (.06)	.06	.17 (.06)	.12**	.10 (.04)	.12*

Scale human babies: $R^2 = .12$ step 1; $\Delta R^2 = .08$ ($p < .0001$).
Scale infant animals: $R^2 = .21$ step 1; $\Delta R^2 = .01$ ($p = .06$).
ΔHuman: $R^2 = .12$ step 1; $\Delta R^2 = .09$ ($p < .0001$).
ΔAnimal: $R^2 = .07$ step 1; $\Delta R^2 = .02$ ($p = .01$).
ΔHuman and ΔAnimal stand for the difference scores between infants and adults of humans and animals respectively.

anticipated, in line with the belongingness theory (Baumeister and Leary, 1995), individuals with a higher need to belong and interpersonal closeness reacted more positively to the babies. Remarkably, these effects seemed to be robust to the possible negative influence of narcissism. In other words, although narcissists typically have problems with social functioning, they fail to demonstrate a weaker BSE, at least, when taking into account social connectedness and need to belong.

5. General discussion

The here presented studies pursued the following goals: (1) to establish the presence of the animal BSE, (2) to investigate the associations between the animal and human BSE, and (3) to identify correlates of human and animal BSE. We exposed volunteers to pictures of human babies and infant animals and adults and let them evaluate these pictures. These ratings were examined as a function of gender, age, parental status, empathy, attachment, interpersonal closeness, need to belong, and narcissism.

Some findings replicate previous findings, whereas others were novel and may add significantly to our understanding of the role of BSE in the lives of human adults. More precisely, we demonstrated the presence of the animal BSE in humans and showed that women are more sensitive to it. We further showed that there was a positive, but relatively weak relationship between human and animal BSE. In addition, we provided support that empathy and need to belong are correlates of both human and animal BSE, while interpersonal closeness was exclusively important for the prediction of human BSE. Less consistent results were obtained for age and parental status.

Gender strongly predicted the magnitude of the BSE in all three studies both for human babies and infant animals. This is in line with the findings of previous research (Berman, 1980; Fullard and Reiling, 1976; Glocker et al., 2008; Hildebrandt and Fitzgerald, 1978; Maestripieri and Pelka, 2002; Sprengelmeyer et al., 2009), although Parsons et al. (2011) suggest that the evaluation procedure may make a difference. From an evolutionary perspective, it is adaptive that infants attract more attention from women since they have always served as primary caretakers, although, seen from the perspective of the adult, for both genders it is equally important to maximize the chances of successful reproduction. In that respect, it is less obvious to expect gender differences and the findings of Parsons et al. then become more understandable.

Empathy was found to be positively related to animal BSE in study I, and study II could replicate and extend this finding to humans. In the second study we demonstrated that it is, in particular, the affective dimension of empathy, which is connected with the BSE. Overall, these findings are in accordance with the notion that empathic humans react more positively to other organisms, including human babies and animal infants. In combination with other research demonstrating BSE to modulate brain responses (Glocker et al., 2009), fine motor behavior, attentional focus (Nittono et al., 2012; Sherman et al., 2009), and caregiving (Langlois et al., 1995), we are confident that empathy is an important factor influencing BSE. It is a property that most likely has its basis in the "instinct" to be affected by and take care of helpless creatures (Singer, 2006; Watt, 2005). However, why this feature extends to the animal BSE is still object of exploration. Generally, a close bond with animals may contribute significantly to people's well-being (Beck and Katcher, 2003) which could explain this effect.

The positive relationships with interpersonal connectedness and need to belong also fit this notion (study III). In line with the belongingness theory, individuals with a higher need to belong are more prone to react and provide care to others through which they also maintain and reinforce their own connectedness with others. This process probably underlies the association of higher interpersonal closeness with BSE. These findings further suggest that in the past, individuals with these characteristics might have been more successful with reproduction, which may have contributed to humans becoming "ultrasocial" (e.g., Keltner et al., 2006).

As expected, parental status turned out to be a consistent significant predictor of the human BSE, but results concerning the animal BSE were inconsistent showing one significant result in study II, but not in study I. As already mentioned , finding parents to be more sensitive to the BSE is quite plausible, because becoming a parent may increase sensitivity to BSE or individuals who do not like infants are less likely to become parents. Given the stronger regression weights, we believe that parental status might be especially important for the human BSE, while playing – if at all – a minor role in the animal BSE (as evidenced by the non-significant results of parental status in study I). However, an animal BSE might be seen as a carry-over effect or, alternatively, results from the fact that parents with young children often have pets (Melson, 2003).

The results concerning age were inconsistent too. While in study I age emerged as a predictor of animal BSE, studies II and III both failed to replicate this finding. The regression analysis in study I suggests a decrease with age and we drew a scatter plot to check (figure not shown). The scatter plot revealed a much more conspicuous finding, namely that after the age of 35 the variation in the scores becomes much larger. Combined with the fact, that we identified age as a significant predictor only once – and not at all in human pictures – age may not be influential for the BSE, but future studies should specifically address this aspect.

Contrary to our expectations, no clear associations were found between attachment (studies I and II) and narcissism (study III), on the one hand, and BSE, on the other hand. Only attachment-related avoidance was found to have a weak negative effect on the human BSE in study II. As already discussed, this association seems obvious, since individuals who feel uncomfortable in the presence of others will less likely engage with others, including infants. However, this effect was only weak and needs more consideration in future research. Additionally, narcissism failed to show a significant association with BSE (study III), although the betas indicated the expected direction suggesting that narcissistic individuals tend to react less positively to the presented pictures. Future and more in-depth research, not only relying on self-report, is needed to shed more light onto this association. On the other hand, one may wonder, whether this failure to find strong negative influences is an indication that the BSE, which in previous times was so essential and contributed to the survival of the species, is a very robust phenomenon. In other words, this might suggest that helpless infants are well-equipped to evoke protection and caregiving of all adults, even of those with less favorable personality constructs, such as narcissism.

The ratings of human babies and infant animals were moderately positively associated (studies II and III) while the differences scores, i.e. human and animal BSE were only weakly positively associated. We interpret this as suggestive evidence that the human and animal BSEs not necessarily share *one* common underlying mechanism and are influenced by diverse aspects. An important further question, we are left with concerns the specific nature of the identified relationships. Is the BSE an innate instinct from which several aspects of social functioning originate or, alternatively, is it a trait, which is not directly connected to but rather can be modulated by personality attributes? Since it concerns a very critical instinct with clear survival value and related reproductive success, one might expect that it is indeed quite robust and not easily affected by (adverse) environmental/individual conditions. We tend to believe that the examined social functioning variables may have their origin in this instinct, much similar as empathy is

considered the basis of moral functioning (de Waal, 2008). Future, preferably experimental, studies should further address this issue. Also, premature children are generally considered as being less cute (Kurdahi Badr Zahr and Abdallah, 2001) and the present findings may contribute, among others, to a better understanding of the increased risk of neglect and decreased sensitivity observed in mothers of premature infants, who have been shown to be less emotionally involved, less contingent and congruent to the infant's signals, show less positive expression and enjoy interacting with the baby less (Coppola et al., 2007).

It could also be argued that the animal BSE is an evolutionary anomaly in the sense that it just represents a carry-over effect or overgeneralization of the characteristics significant for the human BSE to animals (e.g., huge eyes of a small living subject). Gould (1980), in this respect, commented that humans are simply "fooled by an evolved response to our own babies". However, alternatively it can be considered that adequate bonds with animals may also contributed to a better evolutionary adaptation and might have had survival value (Wilson, 1984).

The main limitations of these series of studies are the following. First, it may be questioned whether our operationalization of BSE and the applied procedures were optimal. Until now, there is no standard procedure to evaluate BSE. This implies that in different studies not only different stimuli (different animals) have been used, but there are also substantial procedural differences, e.g., the exposure time and the precise evaluation procedures. We chose a cat, dog, horse, chicken, lion, elephant, and rabbit, because we wanted to avoid exposure to animals that may cause fear or other negative emotions (such as snakes or spiders), but it may make sense to make a distinction between different types of animals (e.g., pets and other animals, or dependent on their representation on affect or utility attitude dimensions (e.g., Serpell, 2004)). A further limitation might be the use of self-reports in an online setting. Little is known about the risks of using internet for data collection, in particular whether it may influence dishonesty or social desirability. However, this method of data collection is applied increasingly and there is little evidence indicating that the data collected in this way are less reliable than data collected in a traditional way (Birnbaum, 2004). Moreover, we took some measures to cope with this threat. The questionnaires were part of a larger test battery and we assumed that it is not attractive and thus less likely for potential saboteurs to spend much time to fake answers to a whole test battery than to just a few questionnaires. Other parts of the test battery concerned for example a study about nostalgia (Routledge et al., 2011). In addition, we checked obvious fake answers, i.e. whether people always chose the most extreme answering category thereby ignoring reversed items. We are therefore rather confident to have collected appropriate data and we feel that the present data contribute to a better insight into the specific nature of BSE and its possible correlates. The adequate Chronbach's alphas for the various measures also seem to support the reliability of the data. Another issue is that we used somewhat different wordings (for operationalizing the BSE) in our studies with unknown consequences for the comparability among studies, although the Dutch terms are quite similar in meaning. Moreover, given the recent results of the studies by Nittono et al. (2012) and Parsons et al. (2011), it seems that the additional use of diverse behavioral measures may be helpful to obtain a better understanding of the precise effects of BSE on behavior. Finally, we failed to ask the respondents whether or not they had pets, which might have been a relevant confounder, possibly related to being a parent (Melson, 2003).

6. Conclusions

Humans, in particular women, seem not only sensitive to the human BSE, but also to animal BSE. This is the first study which has focused on possible correlates of this phenomenon. It was found that (affective) empathy and adequate social functioning is positively associated with BSE magnitude. On the other hand, an intriguing finding was that traits, expected to have negative consequences (such as narcissism or insecure attachment), at best had weak effects, suggesting that BSE is a rather robust phenomenon, too important to be seriously impaired by a non-optimal social environment. Given its possible importance for the development of further social functioning, future research is needed to investigate the underlying mechanisms involved in the human and animal BSE, its precise nature, the effects of the applied methods, and the nature of the relationships with individual difference characteristics, connected to social functioning.

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