

## Adult attachment avoidance and automatic affective response to sad facial expressions

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### Abstract

The present work represents the first study to investigate the relationship between adult attachment avoidance and anxiety and automatic affective responses to basic facial emotions. Subliminal affective priming methods allowed for the assessment of unconscious affective reactions. An affective priming task using masked sad and happy faces, both of which are approach-related facial expressions, was administered to 30 healthy volunteers. Participants also completed the Relationship Scales Questionnaire and measures of anxiety and depression. Attachment avoidance was negatively associated with affective priming due to sad (but not happy) facial expressions. This association occurred independently of attachment anxiety, depressivity, and trait anxiety. Attachment anxiety was not correlated with priming due to sad or happy facial expressions. The present results are consistent with the assumption that attachment avoidance moderates automatic affective reaction to sad faces. Our data indicate that avoidant attachment is related to a low automatic affective responsiveness to sad facial expressions.

**Keywords:** *Adult attachment, affective priming, affective response, emotion, mood, personality processes and individual differences, social cognition*

Facial expression of emotion is one of the most important types of emotional signals encountered in interpersonal relationships (Ekman, 1982; Fridlund, 1994). Individuals differ in the information they extract from facial expressions and in the correspondence between the objective expression and the emotional information registered by the observer (e.g., Wagner, MacDonald, & Manstead, 1986). These differences in emotional reactions to facial expressions may be partly explained by differences in individuals' habitual manners of relating to others.

According to attachment theory, infants form internal working models of the self and others mainly through non-verbal (facial and vocal) emotional interactions with primary caregivers (e.g., Bowlby, 1969; Pietromonaco & Feldman Barrett, 2000). Primary caregivers' emotionally expressive faces represent very potent stimuli involved in social and emotional learning during childhood (Stern, 1990). It has been hypothesised that the resulting internal

working models are not necessarily accessible to consciousness, as they become habitual and work automatically (Bretherton & Munholland, 1999).

Recent models of individual differences in attachment organisation hold that there are two basic dimensions underlying adult attachment styles: attachment-related avoidance and attachment-related anxiety (Fraley & Shaver, 2000; Griffin & Bartholomew, 1994a). Attachment-related avoidance corresponds to individuals' tendencies to use avoidant versus proximity-seeking strategies to regulate attachment-related behaviours and thoughts. Individuals high on this dimension withdraw from close relationships and are unwilling to rely on others, whereas individuals low on this dimension are comfortable opening up to others and relying on others as a secure base. Individuals high on attachment avoidance seem to deactivate their attachment behavioural system, which is associated with a down-regulation of emotions and a low intensity of emotionality (Bartholomew & Horowitz, 1991;

Mikulincer & Shaver, 2003; Pietromonaco, Feldman Barrett, & Powers, 2006). Attachment-related anxiety refers to the extent to which subjects are vigilantly attuned to attachment-relevant concerns. Individuals high on the anxiety dimension worry about the availability and responsiveness of significant others (Fraley & Shaver, 2000). Attachment security can be defined as the absence of avoidance and anxiety (Brennan, Clark, & Shaver, 1998). Securely attached adults have positive models of others (Bartholomew & Shaver, 1998). They tend to enjoy intimate relationships, seek out social support, and have the ability to share feelings with other people.

In recent years, several studies were conducted on the perceptual and attentional processing of attachment-relevant stimuli (primarily facial expressions but also lexical stimuli) as a function of individual differences in adult attachment (Dewitte, Koster, deHouwer, & Buysee, 2007; Fraley, Niedenthal, Marks, Brumbaugh, & Vicary, 2006; Magai, Hunziker, Mesias, & Culver, 2000; Maier et al., 2005; Mikulincer, Gillath, & Shaver, 2002; Niedenthal, Brauer, Robin, & Innes-Ker, 2002; Zeijlmans van Emmichoven, van Ijzendoorn, deRuiter, & Brosschot, 2003). It appears that secure attachment leads to greater openness in the perception of positive as well as negative information (Zeijlmans van Emmichoven et al., 2003). There is also evidence that a heightened perceptual vigilance for facial expressions of emotions is associated with a dismissing attachment style (characterised by avoiding rejection) (Maier et al., 2005). Attachment avoidance was also found to be related to an attentional bias away from negative attachment-related information that was presented concurrently with other information (Dewitte et al., 2007). A prerequisite for successful avoidance of negative information could be initial vigilant attention (Niedenthal et al., 2002). Although some research suggests that avoidant defensive strategies can operate fairly effortlessly (Fraley & Shaver, 1997), there is growing evidence that the efficacy of such strategies is attenuated when the mental resources needed to maintain thought suppression are taxed by a high cognitive load (Mikulincer, Dolev, & Shaver, 2004). Thus, it appears that avoidant processing biases could result from the effortful inhibition of attachment-related material (Edelstein & Gillath, 2008).

Whereas many studies, including those mentioned above, have investigated perceptual, attentional, and higher-controlled processing of attachment-related information as a function of attachment style, a fundamental research area remains unexplored: the relationship between attachment orientation and automatic or spontaneous affective responsivity to facial expressions of emotions.

This is one of the most important types of emotional signals encountered in interpersonal communication. Barse (1999) used an adaptation of the affective priming paradigm (Murphy & Zajonc, 1993) to examine the automatic evaluation of the self and significant others. He found that the subliminal presentation of neutral faces of partners and friends elicited automatic positive affective reactions. In the original version of the affective priming paradigm, emotional facial expressions are briefly shown (beneath the threshold of conscious awareness) and participants are asked to evaluate neutral masks. Compared to the neutral or the no prime condition emotion congruent influences of the facial expressions on subsequent judgments are observed (Winkielman, Knutson, Paulus, & Trujillo, 2007). Subliminal affective priming allows us to assess the degree of unconscious affective reactions to emotional faces (Winkielman, Zajonc, & Schwarz, 1997). Interestingly, the use of facial electromyography (facial EMG) to investigate the mechanisms involved in affective priming effects revealed that facial muscles (the *musculus corrugator supercilii*) react congruently to the subliminally presented emotional prime face (Rooteveel, deGroot, Geutskens & Phaf, 2001). These findings can be related to the facial feedback hypothesis, which states that facial expression is the core of the experience of an emotion (Adelmann & Zajonc, 1989).

Using a sample of normal subjects, the present study investigated the relationship between adult attachment style and automatic affective responses to basic facial emotions for the first time. Sad, happy, and neutral facial expressions were used. Sadness and happiness signal an invitation for a social interaction of some sort. Sadness signals that the expresser needs to be cared for and is in a submissive position. Happy expressions are invitations to the perceiver to approach the expresser (Knutson, 1996). Findings of recent studies indicate that attachment avoidance is related to a low degree of emotional responsivity (Mikulincer & Shaver, 2003; Pietromonaco et al., 2006). In particular, people using avoidant strategies to regulate social interactions tend to avoid *negative* emotional states that demand attachment-system activation (Mikulincer & Shaver, 2003). Thus, individuals with avoidant attachment strategies are reluctant to confront relational tensions, as they are unwilling to deal with a partner's distress and need for proximity. However, individuals with avoidant attachment strategies are not characterised by an avoidance of positive interpersonal signals. We therefore hypothesised that attachment-related avoidance should be negatively associated with the extent of automatic emotional responsivity to approach-related *sad* facial expressions. That is, individuals low on attachment

avoidance should show stronger automatic negative affective reactions to sad (but not happy) faces when compared to individuals high on avoidance. Because anxiety is thought to be primarily relevant in modulating the perception of threat-related facial expressions, it was hypothesised that attachment anxiety (as compared to attachment avoidance) would be a poorer predictor of automatic responses to the approach-related facial emotion of sadness.

## Method

### *Participants*

Thirty healthy volunteers (14 females) participated in this study (mean age = 28.5 years,  $SD = 7.5$ ). Participants' mean years of education was 12.6 ( $SD = 1.2$ ). All subjects were free of psychotropic medication and had normal or corrected-to-normal vision. They were screened to exclude those with any previous or current psychiatric, neurological, or medical diseases. The study was approved by the institutional ethics committee. Written informed consent was obtained from all subjects. The Beck-Depression Inventory (BDI; Hautzinger, Bailer, Worall, & Keller, 1995) and the State-Trait Anxiety Inventory (STAI; Laux, Glanzmann, Schaffner, & Spielberger, 1981) were administered to measure participants' depressivity and trait anxiety. Mean BDI score was 3.4 ( $SD = 3.9$ ), and mean STAI trait anxiety score was 34.6 ( $SD = 8.7$ ). The Relationship Scales Questionnaire (RSQ; Griffin & Bartholomew, 1994b; Steffanowski et al., 2001) was applied to assess attachment avoidance and attachment anxiety. The RSQ was designed as a dimensional measure of adult attachment styles. Each questionnaire item was rated on a 1 (not at all like me) to 5 (very much like me) scale. Respondents had to indicate the extent to which they believed each of the 30 statements best described their feelings about close relationships. Because standard RSQ scales have low internal consistencies and the goodness-of-fit of the original measurement model is low (Kurdek, 2002), responses to the RSQ were aggregated using the method proposed by Simpson, Rholes, and Nelligan (1992). Consequently, scores for the dimensions of attachment-related avoidance and anxiety were created. Eight items measured attachment avoidance (e.g., "I am nervous when anyone gets too close to me") and five items measured attachment anxiety (e.g., "I often worry that romantic partners won't want to stay with me"). The average avoidance score was 18.7 ( $SD = 3.3$ ). The average anxiety score was 9.4 ( $SD = 3.3$ ). The two scales had acceptable internal

consistency estimates of reliability ( $\alpha$ s = .71 and .79 for avoidance and anxiety, respectively). Women did not differ from men in attachment-related avoidance ( $t(28) = .48$ ,  $p = .64$ ) or attachment-related anxiety ( $t(28) = -1.11$ ,  $p = .28$ ). The correlation between attachment avoidance and attachment anxiety failed to reach statistical significance ( $r = .32$ ,  $p = .09$ ). Attachment avoidance was not significantly correlated to trait anxiety (STAI) or depressivity (BDI) ( $r = .26$ ,  $p = .17$ ; and  $r = .24$ ,  $p = .20$ ). However, there were significant positive correlations between attachment anxiety and trait anxiety (STAI) and depressivity (BDI) ( $r = .53$ ,  $p < .01$ ; and  $r = .45$ ,  $p < .05$ ).

### *Stimulus materials and procedure*

Facial stimuli for the affective priming experiment consisted of grey-scale normalised sad, happy, and neutral expressions of 10 individuals (Ekman & Friesen, 1976). Emotional and neutral faces were used as primes. Neutral faces of the same individuals were applied as masking stimuli. To avoid identity of prime and mask in the neutral face condition, vertically mirrored faces were used as neutral primes. Eighty trials were shown: 20 with sad faces, 20 with happy faces, 20 with neutral prime faces, and 20 without prime faces. Faces were shown in two fixed random sequences with the restriction of no repetition of an individual and no more than one repetition of a prime condition on consecutive trials. Each trial had a duration of 9 s: A prime face was shown for 33 ms, preceded by a fixation cross for 800 ms, and followed by a neutral face for 467 ms. It followed a blank screen for 7.7 s. In this time period, subjects had to determine whether the briefly shown neutral (mask) face expressed rather negative or rather positive feelings by pressing one of four buttons ( $-1.5$ ,  $-.5$ ,  $+.5$ ,  $+1.5$ ) on a keyboard. Participants were told that the faces had slight differences concerning their affective expressions. For happy faces, we computed a priming score by subtracting mean evaluative ratings for neutral target faces primed by neutral faces from mean evaluative ratings for neutral target faces primed by happy faces. For sad faces, a priming score was computed by subtracting mean evaluative ratings for neutral target faces primed by sad faces from mean evaluative ratings for neutral target faces primed by neutral faces. In the same way, we calculated additional emotional priming scores with the baseline, "no prime face." A negative priming score for sad (happy) faces indicated that subjects rated the neutral targets less negatively (positively) when they were primed by sad (happy) faces, compared with neutral targets primed by neutral faces (or no face).

### Detection task

The detection task was designed to assess (objective) awareness of masked emotional faces. A detection task based on the facial stimuli applied in the priming experiment was administered after the affective priming session. Each of the 40 trials involved the following routine: After a fixation cross was presented for 800 ms, a prime face was presented for 33 ms. This was directly followed by the presentation of a neutral target face for 467 ms. Each prime expression (sad, happy, and neutral) and the no-face control condition were presented 10 times in a fixed random order. Participants were instructed to indicate which of the four conditions was briefly displayed as the prime. The chance level for correct answers was 25%.

## Results

### Performance on the detection task

The mean hit rate for masked sad faces was 17.0% ( $SD=20.0\%$ ), which reflects below chance level performance. The mean hit rate for masked happy faces was 45.3% ( $SD=33.5\%$ ), which is significantly better than chance detection ( $p=.05$ ) but still far from perfect recognition. The higher hit rate for happy facial expression compared to sad facial expression could be due to the fact that the mouths of our happy faces featured smiles revealing white teeth. It is known that the exposed teeth produce high local luminance, resulting in high local contrast around the mouth area. This increases saliency and facilitates detection (Calvo & Nummenmaa, 2008). Hit rate for masked sad faces did not correlate with affective priming (compared to the neutral or no-face baseline). Instead, hit rate for masked happy faces was positively correlated with the priming scores based on happy faces (compared to no-face baseline:  $r=.51, p<.01$ ; and compared to neutral faces:  $r=.33, p=.07$ ). Detection rates were not associated with attachment-related avoidance ( $ps>.87$ ) or attachment-related anxiety ( $ps>.34$ ).

### Correlations of affective priming data with attachment style

Four affective priming scores were calculated on the basis of subjects' mean evaluative ratings. Affective priming for happy faces was calculated by subtracting the mean evaluation score for neutral faces ( $-.011, SD=.29$ ; and for the no-face condition:  $-.034, SD=.29$ ) from the mean evaluation score for happy faces ( $-.003, SD=.32$ ). Affective priming for sad faces was calculated by subtracting the mean evaluation score for sad faces ( $-.050, SD=.27$ ) from the mean evaluation score for neutral faces ( $-.011,$

$SD=.29$ ) and the mean evaluation score for the no-face condition ( $-.034, SD=.29$ ). Thus, in all cases, positive scores indicated prime valence-congruent affective priming. Mean priming scores based on sad faces were .04 ( $SD=.10$  – compared to neutral faces) and .03 ( $SD=.12$  – compared to no faces), whereas mean priming scores based on happy faces were .01 ( $SD=.11$  – compared to neutral faces) and .03 ( $SD=.13$  – compared to no faces). Only the priming score based on sad faces (compared to neutral faces) differed significantly from zero ( $t(29)=2.43, p=.02$ ). Women did not differ from men on affective priming scores ( $ps>.40$ ).

The RSQ avoidance score was significantly negatively associated with affective priming due to sad facial expressions. This was true regardless of baseline condition ( $r=-.39, p=.03$  for the neutral face baseline, see also Figure 1, and  $r=-.42, p=.02$  for the no-face baseline). That is, low avoidance (i.e., secure attachment) was associated with strong negative response tendencies due to masked sad faces, whereas high avoidance was related to weak negative response tendencies. The correlations between RSQ avoidance scores and affective priming due to happy facial expression were not statistically significant ( $r=.01, p=.95$  for the neutral face baseline and  $r=.06, p=.73$  for the no-face baseline). Partial correlations were calculated because the avoidance score on the RSQ tended to correlate positively with depressivity, trait anxiety, and attachment anxiety. After partialling out the effects of depressivity (BDI), trait anxiety (STAI), and attachment anxiety (RSQ), the correlations of avoidance with affective priming due to sad faces (neutral face baseline) ( $r=-.38, p=.049$ ) and with affective priming due to sad faces (no-face baseline) ( $r=-.41, p=.035$ ) were still significant.

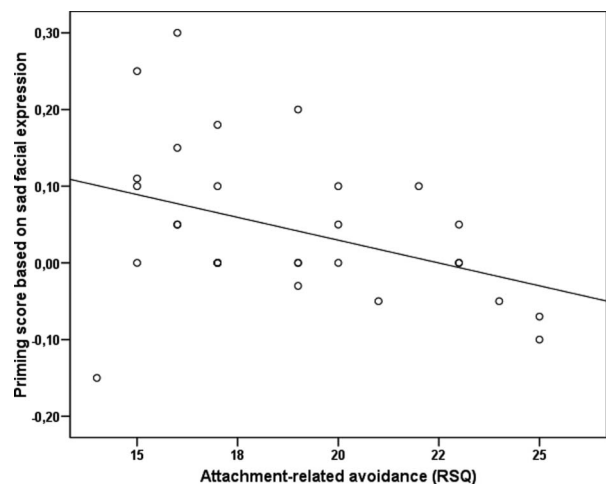


Figure 1. Scatter plot depicting the correlation between RSQ attachment-related avoidance and priming due to masked sad facial expression (compared to neutral face baseline) ( $r=-.39, p<.05$ ).

RSQ anxiety scores were neither correlated with affective priming due to sad facial expression ( $r = .19$ ,  $p = .31$  for the neutral face baseline; and  $r = .24$ ,  $p = .20$  for the no-face baseline) nor with affective priming due to happy faces ( $r = -.30$ ,  $p = .11$  for the neutral face baseline;  $r = -.10$ ,  $p = .58$  for the no-face baseline).

## Discussion

In the present investigation, automatic affective responsivity to approach-related facial emotion was examined as a function of attachment style. Facial expression is among the most important types of emotional signals encountered in interpersonal communication (Ekman, 1982; Fridlund, 1994). Sad and happy facial expressions both invite social interaction, but in different contexts (Knutson, 1996). These two facial expressions signal that a potential increase in interpersonal closeness is desired or impending. In the case of sad faces, the sender calls for assistance and comfort. In our study, attachment avoidance was found to correlate significantly and inversely with affective priming due to sad facial expressions, regardless of baseline condition (neutral face or no prime face). Confirming our hypotheses, the present results suggest that attachment-related avoidance is inversely associated with the automatic affective response to sad facial expression. That is, low avoidance leads to relatively high affective responses to sad faces, whereas high avoidance leads to relatively low negative affective responses to sad faces. This relationship was found to exist independently of depressivity, trait anxiety, and attachment-related anxiety. The present results are consistent with the assumption that attachment avoidance moderates the automatic affective responses to faces expressing sadness. As expected, attachment-related anxiety (as measured by the RSQ) was not found to be related to the automatic affective response to sad (and happy) facial expressions.

Our data indicate that secure (i.e., non-avoidant) attachment is related to a valence-congruent automatic responsivity to sad facial emotions. That is, secure (non-avoidant) individuals appear to be prone to process this facial interaction signal of approach invitation with its correct valence. This might reflect a greater attunement to the sad feelings of others in secure (non-avoidant) persons on an automatic processing level. It has been argued that individuals low on attachment-related avoidance feel comfortable opening up to others (Fraley & Shaver, 2000). Furthermore, there is evidence from experimental attention research that secure attachment leads to a greater openness in the perception of negatively valenced information (Zeijlmans van Emmichoven et al., 2003).

The present findings support the differential association between attachment avoidance and automatic responses to *sad* (but not happy) faces. This is in line with the assumption that people using avoidant strategies to regulate social interactions tend to avoid *negative* emotional states that demand attachment-system activation. According to Mikulincer and Shaver (2003), individuals with avoidant attachment strategies are reluctant to confront relational tensions and are unwilling to deal with a partner's distress and need for proximity and security. Sad faces signal that the expresser suffers from disappointment, loss, or depression and needs support. A low automatic responsivity to masked sad faces could imply a poor automatic elicitation of another individual's negative emotional state. Individuals high on attachment avoidance are characterised by a deactivation of their attachment behavioural system, which leads to a down-regulation of interpersonally experienced emotions (Bartholomew & Horowitz, 1991; Pietromonaco et al., 2006).

It is possible that the spontaneous low affective responsivity of avoidant individuals develops early in childhood and is stored in implicit processing structures (Ainsworth Salter & Bowlby, 1991). It is known that experiences of hostility in social settings result in counter-empathetic emotional reactions (Lanzetta & Englis, 1989). The affective processes investigated in our study are not under conscious control and may reflect a basic emotional characteristic of the internal working model of others, which is assumed to be an automatically functioning system (Bretherton & Munholland, 1999).

The present findings complement results from previous experimental research on controlled processing characteristics associated with attachment orientation. These findings suggest that an avoidant processing bias results from the effortful inhibition of attachment-related material (Edelstein & Gillath, 2008; Mikulincer et al., 2004). From this perspective, avoidant defensive strategies are products of an effortful strategy that occurs rather late in the information processing sequence (Sonny-Borgström & Jönsson, 2004). According to Fraley and Shaver (1997), several mechanisms could contribute to the successful maintenance of an avoidant defensive pattern. These include behavioural strategies, such as avoiding close contact, and emotional strategies, such as not allowing oneself to become emotionally attached. The present research indicates that individual differences in attachment avoidance may also be rooted in variation in unconsciously elicited affective responses to emotion stimuli, that is, those that occur very early in the information processing sequence. In our view, these two positions should not be considered mutually exclusive but be

interpreted as complementary. Adult attachment avoidance could be characterised by a deactivation of the attachment behavioural system at an unconscious/automatic as well as a conscious/controlled processing level. Future research is needed to clarify the relationship between automatic affective responsiveness and effortful processing in adult attachment avoidance. This research should involve the administration of tasks that are sensitive to capture both very early affective processes and late cognitive processes.

Before closing this discussion, some limitations of the present study should be considered. First, we used a self-descriptive instrument (the Relationship Scales Questionnaire) to assess the dimension of attachment avoidance in a sample of healthy adults, thereby limiting the generalisability of our findings. Future research should examine whether our results can be replicated by applying, for example, other highly validated self-report measures, such as the ECR-R (Experiences in Close Relationships - Revised; Fraley, Waller, & Brennan, 2000) and categorical measures of attachment, or by administering other measurement approaches (e.g., semi-structured interviews such as the Adult Attachment Interview; George, Kaplan, & Main, 1985). In the current research, we focused on faces of strangers and did not examine faces of people who played significant roles in the participants' lives. It would be valuable to determine whether the effects observed in the present study generalise across faces that vary in familiarity to the perceiver. Furthermore, it seems necessary to expand the range of emotional expressions examined and particularly focus on studying automatic responsiveness to threatening and/or socially distancing facial emotions (such as fear, disgust, and contempt) as a function of attachment orientation. It has to be noted in this context that it appears especially important to investigate the facial expression of anger. According to some authors (Depue & Iacono, 1989; Harmon-Jones & Sigelman, 2001), anger can be interpreted as an approach-related emotion. It would be interesting to determine whether the automatic affective response to this negative approach-related emotion is also related to either attachment avoidance or attachment anxiety.

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