A multi-modal approach to the study of attachment-related distress

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**Article history:**
Received 10 March 2009
Accepted 10 June 2010
Available online 18 June 2010

**Keywords:**
Adult attachment style
Emotion regulation
Cortisol
Proximity seeking behaviour
Relational stress

**Abstract**
The present study aimed at providing a comprehensive analysis of individual differences in the regulation of attachment distress as measured through different components of the emotional response, including neuroendocrine reactions, subjectively experienced affect, and proximity seeking behaviour. Emotional responses were measured before, during, and after the induction of attachment distress in a sample of couples. Analyses using multi-level modelling revealed that, in both men and women, attachment anxiety was related to physiological (i.e., cortisol) and subjective emotional distress responses, whereas attachment avoidance most consistently predicted subjective and behavioural responses to distress. In addition to one’s own attachment style, partner’s attachment style was also found to modulate emotional and behavioural responses to relational stress, in both couple members. Attachment style was also found to moderate the interrelations between emotional indices, revealing interesting information on the regulatory strategies underlying attachment anxiety and avoidance.

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Through the years, attachment theory (Bowlby, 1982/1969) has become one of the most important conceptual frameworks for understanding the development and nature of individual differences in emotion regulation (Diamond, 2001; Mikulincer and Shaver, 2003). Given that the core function of the attachment system is to alleviate distress in response to threat by seeking support from a significant other, regulatory efforts in the context of attachment have primarily been studied in relation to negative emotions. Furthermore, the majority of adult attachment research has explored distress responses from an individual-differences perspective, emphasizing the quality of attachment relationships as fundamental to the experience and expression of emotions. The integration of contemporary ideas on emotion regulation into attachment theory and research has proven its usefulness for increasing our understanding of the underlying dynamics of attachment functioning (see Mikulincer and Shaver, 2003). That is, evidence on the emotional correlates of attachment processes in relation to psycho-physiological indices, subjective experiences, and behaviour has provided crucial information on the mechanisms through which individual differences in attachment style shape emotional functioning in close relationships (see Diamond, 2001). However, because the evidence stems from studies that measure only one or two emotional indicators at a time and because these studies diverge in sample, procedure, and stress induction, current knowledge on attachment-related emotional responding is still inconclusive and fragmented. Adult attachment research may thus benefit from a more comprehensive test of attachment-style differences in emotion regulation. The present study aimed at extending the analysis of attachment-related distress in a systematic and inclusive way, taking into account the complex and multi-componential nature of emotional responses.

1. Attachment differences in emotional responses and proximity seeking

A basic premise of attachment theory is that individuals differ in their emotion-specific responses and these differences have their origins in past and present attachment experiences. Repeated interactions with an available attachment figure are assumed to result in the development of constructive emotion regulation strategies that are characterized by emotional stability and well-being. Unsupportive interactions, in contrast, give rise to attachment insecurities which are manifested in psychological defenses that distort emotion regulation (e.g., Sroufe and Waters, 1977; Mikulincer and Shaver, 2003). Early attachment experiences are thus implicated in the development of emotion regulation skills that include variation in people’s threshold for detecting threat and strategies to express or inhibit emotions, as well as strategies for regulating closeness-distance towards the attachment figure as a means to cope with feelings of distress and insecurity.

Variation in people’s attachment orientation is commonly described in terms of two independent dimensions that underlie these individual differences in attachment, namely attachment anxiety and avoidance (Brennan et al., 1998). Combining the dimensions of anxiety and avoidance yields the four prototypic attachment styles identified in previous research (i.e., secure, anx-
ious, dismissive, and fearful; Bartholomew and Horowitz, 1991). Both dimensions have been associated with differences in emotional reactivity and regulatory strategies (i.e., hyperactivating versus deactivating the attachment system). The latter have been approached empirically and conceptually as yielding independent and opposite effects on emotion regulation processes. According to the theory, attachment anxiety is marked by heightened and sustained emotional reactivity, catastrophic appraisals, rumination on negative thoughts and persistent proximity seeking efforts. Attachment avoidance, on the other hand, is characterized by attenuated (negative) emotionality which is manifested in the inhibition, denial, and suppression of emotional states that are incongruent with their goal of down-regulating the attachment system. It is further assumed that avoidant individuals inhibit proximity seeking behaviour as a means to minimize closeness and interdependence, and prefer to rely on themselves when coping with distress (for a review, see Mikulincer and Shaver, 2007).

2. The multi-componential nature of emotion regulation in the context of attachment: conceptual and methodological issues

Although predictions from attachment theory are fairly straightforward, evidence on attachment-style differences is less conclusive. This is especially true when considering different types of responding, including self-reports, reaction time tasks, physiological reactivity and behavioural observation (see Mikulincer and Shaver, 2007, for a review). Discrepancies between different types of emotional responses are common in attachment research, which may be understood in light of the dynamical and complex nature of emotion regulation (Gross, 1998; Scherer, 1984). Emotions are inherently multi-level, multi-component processes that are experienced and expressed through changes in different response systems, including experiential (subjective feelings and thoughts), behavioural (e.g., support seeking, facial expressions) and physiological responses (e.g., central autonomic and endocrine response systems) (Frijda and Mesquita, 1998; Gross, 1998). Regulatory efforts can be directed at various parts of the emotion process, altering, magnifying or inhibiting one or more components of the emotional response. Also important is that these strategies can operate in different ways at different levels of responding (i.e., automatic versus controlled) and these multiple processing levels may come into conflict (Gross, 1998). The frequent lack of correspondence across subjective, physiological, and behavioural levels of emotion makes it difficult to draw specific inferences about emotional responding from any single level. This introduces a great deal of complexity in attachment research, especially when making predictions on individual differences. That is, attachment styles may influence stress responses via (1) increased or reduced perceptions and subjective feelings of distress, (2) impairment of emotion regulation strategies in terms of physiological responses and (3) success or failure to obtain security through proximity seeking or distance keeping (see also, Maunder and Hunter, 2001). According to the proposed dynamical, multi-componential view on emotions, differences and similarities may occur among anxious and avoidant individuals at different points in the regulation process. This implicates the need of measuring emotional responses at different levels of analysis. It is thus increasingly apparent that individual differences in attachment responses may not be fully understood by studies restricted to a single level of analysis, regardless of the specific level selected, and that comprehensive accounts of psychophysiological relations require multiple analyses across distinct levels of emotional responding.

A multi-method approach to the study of attachment-related affect is not only interesting from a conceptual angle, it is also much needed to address the methodological loop that compromises research on attachment-style differences in attachment affect and behaviour. That is, based on the semantic content of the items measuring attachment anxiety – which focus on fear of abandonment and negative emotional events – there could be a bias towards linking attachment anxiety to reports of distress and negative affect. The attachment avoidance scale, on the other hand, includes only behavioural items reflecting discomfort with closeness, but no items on emotional experiences. Furthermore, self-reports of avoidance may be biased by the fact that avoidant individuals tend to under-report feelings of distress in the service of keeping an emotionally detached state of mind (Fraley et al., 2000a,b). Including physiological and behavioural measures into the study of attachment affect is thus of key relevance to provide an independent test of attachment-style differences in emotion regulation that is not confounded by shared method variance or item-overlap. In the following, we will discuss what is recently known on attachment-style differences in subjective, physiological and behavioural responses to attachment distress.

3. Current evidence on attachment-related distress responses

3.1. Subjective distress

Traditionally, research on attachment-style differences in emotion has focused mainly on the experiential component of the emotional response by directly asking people about their subjective feelings and thoughts in response to distress. These studies have generally confirmed the hypothesized relationships, showing that high anxious individuals report higher levels of distress and negative mood, whereas those high in attachment avoidance report the opposite pattern (e.g., Collins and Read, 1994; Pietromonaco and Barrett, 1997). Although such self-report measures are extremely useful for identifying consciously accessible affective responses, many components of the emotional experience – especially physiological responses – are assumed to lie outside conscious awareness and are thus not available for reflection and report (Cacioppo et al., 1999). Furthermore, people may sometimes be motivated to distort their self-reported feelings of distress in the service of affect regulation. This would be especially true for avoidant individuals who are inclined to deny any sign of emotionality. In this context, it has repeatedly been shown that the emotional responses of avoidant individuals lack psychobiological coherence, as manifested in discrepancies between their self-reported and physiological reactivity in response to relational stress (e.g., Diamond et al., 2006; Kim, 2006; Maunder et al., 2006). It is thus not surprising that researchers have recently shown increasing interest in the explanatory power of physiological responses and behavioural data, which are believed to index the more automatic (in the sense of less controllable) output of the attachment system (Diamond, 2001). However, compared with the immense literature on self-reported emotional distress responses and their cognitive mediators, data on physiological reactivity and (spontaneous) behaviour in response to attachment distress are still limited.

3.2. Physiological responses

Prior social psychophysiological research has shown that both attachment anxiety and avoidance have implications for physiological aspects of distress regulation. Although most of these studies have focused on physiological distress indicators of heart rate, blood pressure, and electrodermal reactivity to laboratory stressors (e.g., Diamond et al., 2006; Fraley et al., 2000a,b; Kim, 2006;
Maunder et al., 2006), there is now growing interest in measuring attachment distress responses by indexing reactivity of the hypothalamic-pituitary-adrenal (HPA) axis of the endocrine system. The latter releases cortisol in response to social-evaluative threat and interpersonal stressors, especially when the threat contains an element of uncontrollability (e.g., Dickerson and Kemeny, 2004; Kirschbaum et al., 1995). This makes HPA reactivity a likely candidate for studying the psychobiological mechanisms underlying attachment system activation. Furthermore, the relevance of the HPA-axis as a marker for attachment-related differences in emotional responding has been demonstrated in previous research (also see Diamond, 2001, on the role of cortisol in attachment functioning).

Recent work has revealed that HPA reactivity in adults is modulated by attachment insecurity, although the specific type of insecurity varies from study to study. Specifically, in a sample of young adult couples, it was found that attachment avoidance in women was related to increased cortisol responses to a relational conflict discussion, whereas, in male participants, cortisol responses were predicted by attachment anxiety and the combination of anxiety and avoidance (Powers et al., 2006). A related study, however, reported a different pattern of results, with attachment anxiety predicting cortisol reactivity and recovery in both men and women (Laurent and Powers, 2007). Evidence on the link between cortisol and attachment insecurity is further complicated by studies showing that (1) avoidant attachment in male individuals display heightened cortisol responses to distress. These tasks vary in the degree that participants can control their responses and in the degree that the tasks refer to relational issues (i.e., attachment-related versus attachment-unrelated). In a subset of studies, the stress induction task forced people to talk about a relational conflict or challenge in a lab-situation, which may exacerbate stress-related cortisol changes in individuals who habitually rely on avoidance or denial of conflict. This may partly account for the observed association between attachment avoidance and cortisol responding in studies on interpersonal challenges. Second, some studies measured cortisol in a sample of couples, whereas others induced and measured distress in individuals, apart from the relational context. And, as a result, statistical differences in analyzing the timeline of cortisol responses (i.e., multi-level analyses versus difference scores) and the use of different measures of attachment style (i.e., ECR, ECR-R, AAI) impair a direct comparison of results across studies. Different types of stressors and circumstances have a different impact on HPA reactivity (Dickerson and Kemeny, 2004). Hence, to better understand how attachment-style differences are implicated in neuroendocrine stress responses, it may be useful to consider attachment-style differences in HPA reactivity in relation to other markers of attachment system activation such as subjective experiences and behaviour.

3.3. Behavioural responses

The complexity of emotion regulation dynamics in relation to attachment style can also be observed in research on proximity seeking. Stress-induced proximity-distance behaviour can be regarded as a need-oriented emotion regulation strategy (see Taylor et al., 2000) and is in itself a marker of attachment interactions. Hence, proximity seeking towards the attachment figure is an integral part of one’s regulatory efforts and thus plays an important role in shaping emotional responses (Bowby, 1982/1969; Mikulincer and Shaver, 2003). In line with theoretical predictions, research has fairly consistently shown that high avoidant individuals exhibit less proximity seeking behaviour, pull away from their attachment figure if separation is imminent, and provide or seek less support than secure individuals (e.g., Collins and Feeney, 2000; Fraley and Shaver, 1998; Simpson et al., 2002, 1992). Until recently, however, behavioural observation studies failed to find the hypothesized relation between attachment anxiety and proximity seeking, although anxious individuals do report a strong desire for closeness in response to distress (Griffin and Bartholomew, 1994; Dewitte and De Houwer, 2008).

In sum, studies assessing attachment-style differences through various components of emotional responsiveness have demonstrated the potential of psychophysiological parameters for deepening our understanding on the regulation of (negative) emotions that may or may not be expressed overtly in individuals with different attachment orientations. However, previous research did, thus far, produce rather mixed evidence on the distinctiveness of regulatory strategies associated with different forms of insecurity and on the direction and strength of the link between attachment insecurity and psychobiological indicators, which calls for further research. Furthermore, results to date suggest that when attachment differences are examined at different levels of analysis, distinctions among attachment dimensions do not always confirm theoretical expectations (e.g., Roisman et al., 2004).

4. The present study

In the current study, we sought to extend previous work on attachment-related distress by combining measures of neuroendocrine reactivity (cortisol), subjective distress (self-reported affect) and behaviour (proximity seeking versus distance keeping) into one study design. At present, a full understanding of the multi-componential nature of attachment-style differences in emotional distress responses is compromised by the fact that the evidence stems from separate studies using different samples and different stressors. This impairs a direct comparison across studies and may be partly responsible for the inconsistent evidence on attachment-style differences. A multi-method approach to the study of attachment-related distress may provide a more direct test of potential discrepancies or commonalities across multiple emotional response systems in relation to attachment style and advance our knowledge on the source of differences between anxious and avoidant regulatory strategies.

Another merit of the present study is that emotional and behavioural responses are measured in a sample of couples, which allows investigating the reciprocal influence of attachment style on emotional reactivity and regulation. Whereas previous research has focused mainly on individuals or on couples in which only one member (mostly women) underwent a distressing event (e.g., Carpenter and Kirkpatrick, 1996), only few studies assessed the physiological reactions of both couple members in response to a
joint stressor (e.g., Laurent and Powers, 2007; Powers et al., 2006). The latter is, nevertheless, of particular importance, especially because these studies have shown that individuals with insecurely attached partners display increased distress responses. This suggests that ineffective emotion regulation depends on both one’s own and partner’s characteristics.

A final extension to previous work concerns the nature of the stressor. Attachment theory postulates that every event perceived by a person as threatening tends to activate the attachment system (Bowby, 1982/1969). Accordingly, both general and attachment-specific stressors trigger the operation of attachment processes. However, because the emotional markers of attachment are found in interaction with attachment figures’ ability to regulate affect, it has been argued that potential threats to the relationship, whether real or imagined, interfere with the attachment-goal of obtaining felt security and are therefore important sources of distress (e.g., Feeney and Kirkpatrick, 1996; Fraley and Shaver, 1997a,b). Whereas some studies induced a general stress situation that is external to the couple (such as socioevaluative stress or anticipation on a painful task) (e.g., Carpenter and Kirkpatrick, 1996; Ditzen et al., 2008), other studies relied on a relational conflict discussion task (e.g., Powers et al., 2006). Although the induction of an intra-couple stressor has advantage compared to an external stressor, discussing a relational conflict is also confounded by gender roles (imposing stress that is not only related to attachment processes), is more or less controllable, and its emotional reactions can be modulated ‘online’ by means of direct partner feedback (i.e., escalation, disengagement, support). To address these concerns, the present study aimed at exploring emotional reactivity in response to a relational stressor that induces jealousy, secrecy, and uncertainty. Such stressor is conceptually closely related to attachment insecurity (i.e., threat of relational change), contains an element of uncontrollability, and is likely to be experienced similarly by men and women (see Guerrero, 1998). Furthermore, we did not force participants to discuss the relational stressor, which allows measuring “naturally” occurring reaction patterns. Specifically, we suggested to both couple members that his/her partner would be interviewed about intimate aspects of their past and current romantic relationships, including sexual issues, by an attractive man/woman (i.e., rival) and that afterwards they would watch a video of the interview together (that may, however, be censored by the interviewed partner). Because our stressor is primarily based on suggestion, it can be expected that the interpretation and cognitive elaboration on the stressor is biased by attachment schemas of the self and the relationship, allowing a more process-pure analysis of attachment effects.

In sum, we measured subjective, physiological, and behavioural responses in a sample of young adult couples in response to a relational stressor. Physiological and subjective reactions were measured before, during, and after the stress induction, allowing us to investigate both stress reactivity and recovery as a function of attachment style. Given that slower recovery after a stressful event may be as detrimental as heightened reactivity (Dickerson and Kemeny, 2004), it is valuable to examine in what way attachment insecurity influences recovery processes. In addition, we also explored whether the relationships between attachment style and emotional responses would differ for men and women.

5. Method

5.1. Participants

68 young adult heterosexual couples (total of 136 individuals) participated in the study in return for a monetary reward of 25 euro. Conditions for recruitment were that participants had been involved in a romantic relationship with their partner for at least 1 year (to assure that we were dealing with ‘real’ attachment relations, see Fraley and Davis, 1997). One couple refrained from participating during the course of the experiment, leaving the final sample at a total of 67 couples. The mean age of the participants was 23.4 years for the men (ranging from 19 to 30 years) and 21.8 years for the women (ranging from 19 to 27 years) and the average relationship duration was 1.6 years (ranging from 1 to 4 years). Participants were recruited by emailing students from various faculties at Ghent University, announcing that an experiment on physiological reactions within relationships would take place. They could subscribe to the experiment electronically. Most of the female participants were psychology students.

In the interest of obtaining accurate hormone measurements, participants were instructed not to drink alcohol, use drugs, or visit the dentist within the 24 h prior to the study, or to eat, drink coffee or cola, smoke cigarettes, or brush their teeth up to 2 h prior. Participants also rinsed their mouths thoroughly with water before giving the first saliva sample to minimize the potential for contamination. Given that cortisol levels follow a circadian rhythm, we tried to reduce the amount of noise in the data by inviting participants to the lab at three fixed moments: at 11 a.m., at 4 p.m., and at 6 p.m. This time variable was statistically controlled in the reported analyses and did not modulate the effect of attachment style on cortisol responding.

5.2. Procedure

The experiment took place in a three-room suite, consisting of a large middle room and two smaller adjacent rooms. The middle room contained several chairs and tables, two leather couches, a television with a video, and three small (but visible) cameras. Participants were instructed to come to the lab with their romantic partner. Upon arrival at the laboratory, they were asked to relax for several minutes in the middle room to ensure that the participants’ physiological reactions were at resting rates for the baseline measure. Their behaviour was videotaped, although this was not openly revealed to the participants at that time. Next, two experiment leaders entered the room and explained that cortisol would be measured in response to several tasks. After signing the informed consent form, a first saliva sample was taken while the participants reported on their current mood on VAS scales. Because it takes 15–20 min to travel from the adrenal cortex to saliva (Stansbury and Gunnar, 1994), this sample actually reflects participants’ cortisol response 5–10 min prior to entering the lab. Next, the experiment leaders separated the couple by both taking one of the partners to the adjacent rooms. There, the relational distress induction took place by letting the participants believe that the other partner would return to the middle room in which he/she would be interviewed about intimate and current romantic relationships, including sexual issues, by an attractive man/woman who would make their partner feel at ease (a detailed overview of the distress induction is available from the authors). They were also told that the interview would be videotaped (without their partner knowing this) and that, afterwards, they would get the opportunity to watch the video together with their partner. However, their partner would be free to refuse this or would get the occasion to cut several passages from the video. Note that the distress induction was based on suggestion, so the interview did actually not take place. The distress induction was identical for both couple members. After reporting on their mood in response to the relational distress induction, the experiment leader left the room and the participants completed questionnaires while ‘waiting for their partner to finish the interview’. They also completed additional measures that we will not discuss further in this manuscript. 20–25 min after the distress induction, we took a second saliva sample. This time point allows adequate time for the distress-reaction to be reflected in salivary cortisol concentrations. Subsequently, the partners were
reunited in the middle room and were placed in front of the television to watch the interview. The experiment leader acted as if she was forgotten to bring the videotape and left the couple alone for several minutes to fetch the videotape from the technical room. Meanwhile, the couple learned from each other that they were deceived and that the interview did actually not take place. Again, the reactions of the couple were unobtrusively videotaped (during the first 2 min) to observe their spontaneous attachment behaviour. At the end of the experiment, the experiment leaders returned to the room and the couple was informed about the design of the experiment, after which they reported on their current mood on VAS scales. Fifteen minutes later, during which they filled in some additional forms, we took a final saliva sample (about 45 min after the stress induction itself), depicting stress recovery. Finally, we fully debriefed them about the aim of the experiment. This experimental procedure was approved by the ethical committee of Ghent University, Faculty of Psychology and Educational Sciences.

5.3. Measures

5.3.1. Cortisol

Three salivary cortisol samples were collected over the course of the session to measure participants' HPA reactivity and recovery to the relational distress induction. To collect the saliva, participants were encouraged to suck on a 6-inch sterile cotton roll (i.e., a salivette) until the cotton was saturated with saliva. The Salivette tubes were stored frozen at −20 °C until shipped on dry ice to the university hospital of Brussels for biochemical analysis. Before assaying for free cortisol, samples were centrifuged at 3000 rpm for 10 min to obtain 0.5–1.0 ml clear saliva. The cortisol concentration in saliva was analyzed by a time-resolved immunoassay with fluorescence detection.

5.3.2. Behaviour

Participants' spontaneous behaviour was observed before and after the relational distress induction. To obtain an objective assessment of attachment behaviour during the baseline and distress interaction, two independent observers, who were unaware of participants' attachment scores, coded behavioural responses (e.g., eye contact, bodily contact, asking questions, avoiding the subject, avoidant behaviour) along a proximity and avoidance dimension on a 10-point likert-scale (ranging from not at all to very much). Because previous observational research has shown that the majority of attachment distress responses can be classified into proximity-maintenance behaviour (e.g., Fraley and Shaver, 1998) and because proximity seeking is theoretically defined as the main regulatory attachment strategy, we coded the behaviour on only one proximity-distance dimension. Importantly, we coded the behaviour of each partner, not the couple as unit, and we coded only the first 2 min after reunion (thus not after they learned about the deception) to ensure that we were observing distress reactions that reflect strategies to seek reassurance, support and regain security. Inter-coder reliability was satisfactory for all judgments (Cronbach alphas ranging from .72 to .86), indicating significant consensus between observers.

5.3.3. Self-reported distress

Visual analogue scales were used to assess the strength of negative affect at each experimental phase. Participants were asked to place a mark on a 10-cm line, according to how much they felt distressed, anxious, worried, and tense at that moment (responses were averaged to get an overall measure of negative affect). In addition, participants also reported on their feelings of indifference and jealousy. We used continuous line rating scales to make it less likely that participants would remember their responses. This type of VAS scales is regularly used in research on mood measure-

ment (McCormack et al., 1988) and has also been used with success in previous research on attachment distress (see Dewitte and De Houwer, 2008).

Attachment style was measured using a Dutch translation of the Experiences in Close Relationships Scale-revised (Experiences in Close Relationships scale, Fraley et al., 2000a,b; ECR-R-NL, Buysse and Dewitte, 2004), which is a dimensional self-report measure that includes the scales Anxiety (about abandonment) and Avoidance (of closeness), each based on 18 items. In the current sample, Cronbach alphas were high for the Anxiety subscale (α = .90) as well as for the Avoidance subscale (α = .95). The Anxiety and Avoidance scores were significantly correlated for both men, r = .48, p < .01, and women, r = .36, p < .05. Also, partners' scores on similar attachment dimensions were significantly correlated, r = .32, p < .01 for Anxiety scores and r = .40, p < .01 for Avoidance scores.

5.4. Data analyses

Because the dependency of dyadic data and the repeated measurements of cortisol, subjective distress and behaviour, we used Hierarchical Linear Modelling (HLM 6.06, Raudenbush and Bryk, 2004) to analyze the main study questions. Two types of HLM-analyses were conducted. First, we analyzed the association between attachment style and emotional responses using the couple as unit of analysis. In these analyses, each of the emotional indicators (i.e., cortisol reactivity, subjective affect and behavioural responses) were entered as separate dependent variables. Secondly, we investigated the moderating effect of attachment style on the within-person associations between the different emotional responses. These interrelations were tested at the individual level, analyzing the data separately for men and women.

In a first series of HLM models, the couple was the unit of analysis, with female and male distress responses nested within the couple. An important advantage of HLM is that it allows estimating within-person and between-person effects simultaneously such that the unique and independent effects of each parameter can be estimated, controlling for the effects of the other parameters. Furthermore, HLM takes into account missing cases at Level 1, which prevents loss of data, and it adjusts the distress responses for measurement error. We used the following equation to model the emotional (i.e., cortisol and self-reported distress) and behavioural responses in our study:

\[
Y_{ij} = \beta_{0j} + \beta_{1j} (female intercept) + \beta_{2j} (female linear) + \beta_{3j} (male intercept) + \beta_{4j} (male linear) + e_{ij}
\]

Level 2 (between-couple)

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\beta_{0j} = \gamma_{1j} + \gamma_{12} (predictor 1) + \gamma_{13} (predictor 2) + \ldots + u_{1j}
\]

\[
\beta_{1j} = \gamma_{2j} + \gamma_{23} (predictor 1) + \gamma_{24} (predictor 2) + \ldots + u_{2j}
\]

\[
\beta_{3j} = \gamma_{3j} + \gamma_{33} (predictor 1) + \gamma_{34} (predictor 2) + \ldots + u_{3j}
\]

\[
\beta_{4j} = \gamma_{4j} + \gamma_{43} (predictor 1) + \gamma_{44} (predictor 2) + \ldots + u_{4j}
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Y_{ij} = \text{the dependent variable } i \text{ for couple } j \text{ with } i = 1 \ldots 6 \text{ data points and } j = 1 \ldots 67 \text{ couples. Within each couple, male and female trajectories are modelled separately (within the dyadic unit), as shown by the different sets of coefficients. Because we were interested in responses to the relational distress induction, we rescaled time in our models so that the intercept represents the time point.}

1 Although it can be expected that the distress indicators follow a curvilinear pattern, namely rising to a peak during distress induction and then falling back to baseline, we did not include a quadratic term because we have only three measurement points. This implies that we did not have enough degrees of freedom to include a quadratic term. Note that the addition of a quadratic term did not result in a significant improvement of model fit.
of the distress induction. This implies that the male and female intercepts reflect their level of distress activation (based on both baseline activity and stress-related activity), and their slopes reflect the degree of ongoing reactivity or recovery (as a function of the timing of peak reactivity) during the stressor. In the case of our behavioural measurement, we did not model a time variable, because behaviour included only two time points (before and after distress) (see Duncan and Duncan, 2004).

To analyze the relation between attachment dimensions and distress responses, individual trajectories are modelled at Level 1, and predictors are added at Level 2 to explain the variability in the Level 1 parameters. The predictors were attachment anxiety and avoidance scores and their interaction term, for both couple members. We tested separate models for each of the emotional and behavioural indicators, using the same HLM equations.

In a second series of analyses, we investigated whether the within-person associations between emotional responses were moderated by attachment style. That is, we tested whether the within-person slope relating, for example, cortisol with subjective affect varies at the between-person level, as a function of attachment style. This required considering men and women as separate units of analyses. We used the same equations as described above, except that the Level 1 model included only a male or female intercept at a time. Furthermore, to reduce complexity, we included only the male and female attachment scores at Level 2, without considering cross-partner effects. The latter are analyzed and described in detail in the first series of HLM-models.

6. Results

6.1. Descriptive statistics of the study variables

Means and standard deviations of our study variables at baseline, distress induction, and recovery are reported in Table 1. Repeated measures mean comparisons showed that, for men, physiological reactions showed no significant differences across the three measurement points. With regard to self-reported negative affect, we found that men reported less negative affect during recovery compared to distress and that both men and women reported higher levels of jealousy in response to the stressor. Finally, both men and women displayed more proximity and less distance behaviour after the distress induction compared to baseline.

6.2. Relation between each of the emotional responses and attachment style

To address the research questions, a series of HLM models were tested. First, we tested a baseline model with no predictors at Level 2 to demonstrate average male and female outcome scores and the proportion of variability to be explained at Level 2. For all the distress indicators, the baseline model revealed a substantial amount of variance unexplained by the Level 1 model, indicating that there was significant variability across couples in male and female distress parameters, which justifies further analysis of predictor variables.2 Next, sets of predictors were added to test an attachment × partner model, including the participant’s own and the partner’s attachment scores to predict each of his/her parameters. Given the increase in parameters relative to our sample size and the small number of measurement points, we fixed the error terms for the male and female linear slopes. Due to space limits, we report only those figures that illustrate complex relationships.3

2 Given the large number of analyses conducted in the present study, we did not report the results of the baseline model (i.e., average male and female outcome scores and proportion of variability). However, a table of results for the unconditional model is available from the authors.

3 The other figures are available from the authors.

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Table 1

Descriptive statistics of our study variables.

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<td>Cortisol</td>
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<td>6.76 (3.31)</td>
<td>5.67 (3.41)</td>
<td>19.54**</td>
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<td>Subjective affect</td>
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<td>Negative affect</td>
<td>50.85 (4.70)</td>
<td>53.79 (4.43)</td>
<td>37.89 (3.69)</td>
<td>6.40**</td>
<td>48.51 (4.92)</td>
<td>58.1 (5.78)</td>
<td>61.05 (7.38)</td>
<td>2.10</td>
</tr>
<tr>
<td>Indifference</td>
<td>16.80 (1.79)</td>
<td>14.94 (1.97)</td>
<td>15.58 (2.06)</td>
<td>.58</td>
<td>18.81 (2.41)</td>
<td>17.20 (2.36)</td>
<td>21.63 (2.50)</td>
<td>2.8</td>
</tr>
<tr>
<td>Jealousy</td>
<td>5.2 (1.10)</td>
<td>8.46 (1.41)</td>
<td>10.15 (1.64)</td>
<td>3.35</td>
<td>5.85 (1.08)</td>
<td>12.24 (1.98)</td>
<td>10.15 (2.34)</td>
<td>8.31**</td>
</tr>
<tr>
<td>Behaviour</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proximity behaviour</td>
<td>6.35 (1.43)</td>
<td>7.30 (1.95)</td>
<td>13.08**</td>
<td>7.27 (1.43)</td>
<td>7.94 (1.86)</td>
<td>8.51**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance behaviour</td>
<td>4.24 (1.80)</td>
<td>3.06 (2.38)</td>
<td>10.55**</td>
<td>3.00 (1.95)</td>
<td>1.97 (2.25)</td>
<td>11.12**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p ≤ .05.
** p ≤ .01.

---

Table 2

HLM standardised coefficients of Level 2 predictors on cortisol.

<table>
<thead>
<tr>
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<th>Coeff.</th>
<th>t</th>
<th>Coeff.</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Distress</td>
<td>Slope</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Male partner</td>
<td></td>
<td>Female partner</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Male anxiety</td>
<td>.33</td>
<td>2.36**</td>
<td>.21</td>
</tr>
<tr>
<td></td>
<td>Male avoidance</td>
<td>−.15</td>
<td>−1.11</td>
<td>−.18</td>
</tr>
<tr>
<td></td>
<td>Male anxiety × avoidance</td>
<td>−.03</td>
<td>−.30</td>
<td>.10</td>
</tr>
<tr>
<td></td>
<td>Female anxiety</td>
<td>−.08</td>
<td>−.58</td>
<td>−.09</td>
</tr>
<tr>
<td></td>
<td>Female avoidance</td>
<td>−.05</td>
<td>−.28</td>
<td>.00</td>
</tr>
<tr>
<td></td>
<td>Female anxiety × avoidance</td>
<td>.26</td>
<td>1.48</td>
<td>.01</td>
</tr>
<tr>
<td></td>
<td>Female partner</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female anxiety</td>
<td>.29</td>
<td>2.66**</td>
<td>.17</td>
</tr>
<tr>
<td></td>
<td>Female avoidance</td>
<td>.22</td>
<td>1.15</td>
<td>.09</td>
</tr>
<tr>
<td></td>
<td>Female anxiety × avoidance</td>
<td>.08</td>
<td>.57</td>
<td>.28</td>
</tr>
<tr>
<td></td>
<td>Male anxiety</td>
<td>.02</td>
<td>.15</td>
<td>−.02</td>
</tr>
<tr>
<td></td>
<td>Male avoidance</td>
<td>.09</td>
<td>.48</td>
<td>.09</td>
</tr>
<tr>
<td></td>
<td>Male anxiety × avoidance</td>
<td>−.05</td>
<td>−.25</td>
<td>−.17</td>
</tr>
</tbody>
</table>

* p ≤ .05.
** p ≤ .06.
*** p ≤ .01.
sol during recovery. Furthermore, the interaction between female anxiety and avoidance significantly predicted the rate of their stress reactivity in response to distress. An examination of predicted cortisol trajectories plotted at low (25th percentile) and high (75th percentile) values of female anxiety and avoidance indicated that particularly high anxious–high avoidant (i.e., fearful) women showed a steep increase in cortisol responses during distress and recovery (Fig. 1). One partner effect reached significance; the interaction between male’s anxiety and avoidance significantly predicted the rate of female cortisol responses. By plotting high and low values on male anxiety and avoidance, it was found that women with secure partners had the lowest level of cortisol in response to distress and showed a decrease in cortisol throughout the entire trajectory. The cortisol responses of women with more fearfully attached boyfriends, on the other hand, gradually increased from baseline to recovery (Fig. 2).

6.4. Self-reported affect

The analyses on negative affect revealed that, in both men and women, attachment anxiety yielded a positive and significant effect on self-reported negative affect in response to relational distress (Table 3). For women, anxiety also predicted the rate of their self-reported stress reactivity. Specifically, the more anxiously attached women seemed to report increasingly high levels of negative affect during distress and recovery, whereas low anxious women showed a relatively flat slope. In both men and women, the effect of attachment avoidance also reached significance at the point of distress, indicating that higher avoidance is associated with an increase in reported negative affect when faced with a relational stressor. Regarding the predictive value of partner’s attachment style, we found that male participants with more avoidant girlfriends reported more negative affect at the point of distress (Fig. 3), whereas female participants tended to report a slight decrease in negative affect from distress through recovery when their boyfriends were higher in avoidance (Fig. 4).

With regard to self-reported jealousy, results showed that, in both men and women, attachment anxiety was related to greater jealousy responses in reaction to the relational stressor, and in women feelings of jealousy were found to persist throughout recovery. Remarkably, we also found an effect of attachment avoidance on female jealousy, indicating that the more avoidantly attached women reported higher levels of jealousy at the point of distress. As can be seen in Table 3, also the interaction of female anxiety and avoidance significantly predicted the rate of their jealousy

---

Table 3

<table>
<thead>
<tr>
<th></th>
<th>Negative affect</th>
<th></th>
<th>Jealousy</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Distress</td>
<td>Slope</td>
<td>Distress</td>
<td>Slope</td>
</tr>
<tr>
<td></td>
<td>Coeff.</td>
<td>t</td>
<td>Coeff.</td>
<td>t</td>
</tr>
<tr>
<td>Male partner</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male anxiety</td>
<td>.30</td>
<td>2.50**</td>
<td>.04</td>
<td>.35</td>
</tr>
<tr>
<td>Male avoidance</td>
<td>.29</td>
<td>2.05**</td>
<td>.00</td>
<td>.00</td>
</tr>
<tr>
<td>Male anxiety × avoidance</td>
<td>−.23</td>
<td>−1.72</td>
<td>.02</td>
<td>.25</td>
</tr>
<tr>
<td>Female anxiety</td>
<td>−.16</td>
<td>−1.69</td>
<td>.04</td>
<td>.53</td>
</tr>
<tr>
<td>Female avoidance</td>
<td>.35</td>
<td>2.14**</td>
<td>.03</td>
<td>.26</td>
</tr>
<tr>
<td>Female anxiety × avoidance</td>
<td>.01</td>
<td>.05</td>
<td>−.20</td>
<td>−1.70</td>
</tr>
<tr>
<td>Female partner</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female anxiety</td>
<td>.27</td>
<td>2.89**</td>
<td>.24</td>
<td>3.95***</td>
</tr>
<tr>
<td>Female avoidance</td>
<td>.50</td>
<td>3.07***</td>
<td>.03</td>
<td>.24</td>
</tr>
<tr>
<td>Female anxiety × avoidance</td>
<td>.13</td>
<td>1.04</td>
<td>.08</td>
<td>.92</td>
</tr>
<tr>
<td>Male anxiety</td>
<td>.13</td>
<td>0.85</td>
<td>.04</td>
<td>.46</td>
</tr>
<tr>
<td>Male avoidance</td>
<td>−.31</td>
<td>−1.80</td>
<td>−.16</td>
<td>−1.85*</td>
</tr>
<tr>
<td>Male anxiety × avoidance</td>
<td>−.09</td>
<td>−.89</td>
<td>−.14</td>
<td>−1.12</td>
</tr>
</tbody>
</table>

---

Fig. 1. Female cortisol responses at low (25th percentile) and high (75th percentile) values of female anxiety and avoidance.

Fig. 2. Female cortisol responses at low (25th percentile) and high (75th percentile) values of male anxiety and avoidance (the present sample did not include females with dismissive partners).
Furthermore, sepa­
trajectory showed the steepest increase in jealousy throughout the entire
reports of jealousy slightly increased. Fearfully attached women
ously from distress through recovery, whereas, in anxious women,
that both secure and dismissive women reported a decline in jeal­
high (75th percentile) values of anxiety and avoidance indicated
responses. Plotting these responses at low (25th percentile) and high (75th percentile) values of anxiety and avoidance indicated that both secure and dismissive women reported a decline in jealous­
ousness from distress through recovery, whereas, in anxious women, reports of jealousy slightly increased. Fearfully attached women showed the steepest increase in jealousy throughout the entire

Finally, the analyses on our measure of indifference revealed that both men and women with higher scores on attachment avoidance reported greater indifference in response to distress, \( t(60) = 3.04, p < .01 \) for men and \( t(60) = 3.13, p < .01 \) for women. None of the other effects were significant, neither were the effects of partner’s attachment style, all \( p’s > .08 \).

6.5. Behaviour

Because behaviour was observed at only two measurement
point, we did not include a time variable at Level 1 (i.e., there are
not enough degrees of freedom to estimate the error variances from the
data, see Duncan and Duncan, 2004), and therefore we ran two
separate HLM models with behaviour observed at baseline and in
response to distress as dependent variables. Moreover, separate
analyses were conducted on proximity and distance behaviour. Attachment anxiety, avoidance and their interaction term (both their own and partners’ scores) were entered as predictor variables at Level 2. HLM was used in order to account for the dependency between couple data in outcome scores. The analyses on proximity behaviour at baseline revealed a significant effect of attachment avoidance on male’s proximity behaviour, indicating that, at baseline, the more avoidantly attached men displayed less proximity behaviour towards their partner, \( t(60) = -2.50, p = .01 \). No effects were found of partner’s attachment style, all \( p’s > .10 \). Neither did we find an effect of attachment on female proximity behaviour, all \( p’s > .10 \). After the distress induction, attachment avoidance signifi­
cantly predicted lower levels of proximity behaviour, both in men, \( t(60) = -1.98, p < .05 \), and women, \( t(60) = -2.12, p < .05 \). In addition, it was found that male participants with more anxiously attached partners displayed more proximity behaviour after the induction of relational distress, \( t(60) = 2.16, p < .05 \).

The analyses on distance behaviour revealed no significant effects of participants’ own attachment scores on baseline behaviour, neither in men or women, all \( p’s > .10 \). Several part­
tner effects, on the other hand, did reach significance. Specifically, it was found that male participants with more avoidant girl­
friends displayed more distance behaviour, \( t(60) = -1.94, p < .05 \). Furthermore, male’s distance behaviour at baseline was also pre­
dicted by the interaction between female anxiety and avoidance, \( t(60) = -1.96, p < .05 \). Further examination of this interaction effect revealed that men with anxious and avoidant girlfriends kept more distance towards their partner compared to men with secure and fearful girlfriends (Fig. 6). After the distress induction, both
men and women with higher scores on attachment avoidance dis­
pplayed more distance behaviour towards their partner, \( t(60) = 2.46, p < .05 \) for men and \( t(60) = 2.36, p < .05 \) for women. In addition, the interaction between female’s anxiety and avoidance scores signifi­
cantly predicted male’s distance behaviour in response to distress, \( t(60) = 1.94, p < .05 \). An examination of this interaction effect plotted at high and low levels of female anxiety and avoidance revealed the opposite pattern as during the baseline observation. That is, male participants with secure partners displayed the most distance
behaviour after distress, whereas men with high anxious and high
avoidant partners displayed the least distance behaviour (Fig. 6).

4 Running a model with only a male and female intercept, but no time variable, would not allow separating the effect of attachment style on behaviour at baseline from its effect on behaviour after distress. Therefore, we decided to run two separate models on behaviour (i.e., at baseline and in response to distress).

---

**Fig. 3.** Female avoidance, plotted at low (25th percentile) and high (75th percentile) values, predicts male’s self-reported negative affect.

**Fig. 4.** Male avoidance, plotted at low (25th percentile) and high (75th percentile) values, tended to predict female’s self-reported negative affect.

**Fig. 5.** Female’s self-reported jealousy responses plotted at low (25th percentile) and high (75th percentile) values of female’s anxiety and avoidance.
Table 4
HLM standardised coefficients of Level 2 predictors as a function of the relation between subjective affect and behavioural responses.

<table>
<thead>
<tr>
<th></th>
<th>Negative affect</th>
<th>Jealousy</th>
<th>Indifference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Proximity</td>
<td>Distance</td>
<td>Proximity</td>
</tr>
<tr>
<td></td>
<td>Coeff.</td>
<td>t</td>
<td>Coeff.</td>
</tr>
<tr>
<td>Men</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male anxiety</td>
<td>.64</td>
<td>4.22***</td>
<td>.59</td>
</tr>
<tr>
<td>Male avoidance</td>
<td>.21</td>
<td>1.26</td>
<td>.24</td>
</tr>
<tr>
<td>Male anxiety × avoidance</td>
<td>-.25</td>
<td>-1.09</td>
<td>-.12</td>
</tr>
<tr>
<td>Women</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female anxiety</td>
<td>.36</td>
<td>3.37***</td>
<td>.38</td>
</tr>
<tr>
<td>Female avoidance</td>
<td>.43</td>
<td>1.91***</td>
<td>.43</td>
</tr>
<tr>
<td>Female anxiety × avoidance</td>
<td>.08</td>
<td>.52</td>
<td>.12</td>
</tr>
</tbody>
</table>

Fig. 6. Male’s distance behaviour at baseline and after distress plotted at low (25th percentile) and high (75th percentile) values of female’s anxiety and avoidance.

6.6. Interrelations between emotional responses as a function of attachment style

A second series of HLM-models were tested to investigate whether the interrelations between different emotional responses were moderated by attachment style. We included a particular emotional response as the outcome variable (e.g., cortisol) and added another emotional response at Level 1. Attachment anxiety, avoidance and their interaction term were entered as predictor variables at Level 2.

6.7. Cortisol and subjective affect

Results showed no association between physiological responses and self-reported affect in men, all p’s > .10, whereas in women, negative affect and jealousy did relate to cortisol responses during distress and recovery. These interrelations were moderated by attachment anxiety, indicating that for the more anxious women, higher scores of cortisol corresponded with higher scores of negative affect, t(59) = 2.04, p < .05, and jealousy, t(59) = -2.21, p < .05. In addition, the interaction between female anxiety and avoidance moderated the relation between cortisol and reports of negative affect, t(59) = 2.52, p < .05. Plotting stress responses at low (25th percentile) and high (75th percentile) values of anxiety and avoidance indicated that in secure, anxious and fearful women, higher scores of cortisol related to higher scores of negative affect, with fearful individuals showing the highest cortisol and negative affect responses. In dismissive individuals, the relation between cortisol and subjective affect was found to diverge. Whereas cortisol responses were low and stable throughout the entire trajectory, subjective affect responses were high, yet slightly declining from baseline through recovery.

6.8. Cortisol and behaviour

In men, no association was found between cortisol responses and proximity or distance behaviour as a function of attachment style, all p’s > .10. In women, physiological and behavioural responses were related and this association was moderated by attachment anxiety, t(59) = 2.54, p < .05 for proximity and t(59) = 2.37, p < .05 for distance behaviour. Concretely, we found that for the more anxious women, higher cortisol responses were associated with more proximity and distance behaviour in response to distress.

6.9. Subjective affect and behaviour

Table 4 shows that, in both men and women, the association between subjective affect (i.e., negative affect and jealousy) and behavioural responses depended on the level of attachment anxiety. Results showed that anxious individuals who reported more negative affect and jealousy in response to distress also displayed more proximity seeking and more distance keeping (see Table 4). We also found that attachment avoidance moderated the relationship between reports of indifference and proximity-distance behaviour. In the more avoidant individuals (i.e., both men and women), higher scores of indifference corresponded with more distance and less proximity behaviour in response to distress (see Table 4). In women, attachment avoidance also moderated the relation between behavioural responses and the other indices of negative affect (i.e., negative affect and jealousy). Concretely, we found that the more avoidant women displayed more proximity and distance behaviour in response to distress when reporting more negative affect and jealousy as well.

7. Discussion

The present study aimed at providing a comprehensive analysis of individual differences in regulating attachment distress as measured through different components of the emotional response, including neuroendocrine reactions, subjectively experienced affect, and proximity behaviour. In general, our results showed that, in both men and women, attachment anxiety was related to physiological (i.e., cortisol) and subjective emotional distress responses, whereas attachment avoidance most consistently predicted subjective and behavioural responses to distress. In addition to one’s own attachment style, partner’s attachment style was also found to modulate emotional and behavioural responses to relational stress, in both couple members. Furthermore, attach-
ment style was found to moderate the interrelations between emotional indices, revealing important information on the regulatory strategies underlying attachment anxiety and avoidance. We will briefly discuss these findings in the following paragraphs and try to explain them from a theoretical perspective on attachment-related emotional responding.

As hypothesized, we found that attachment styles play an important role in explaining distress responses, with both dimensions of attachment insecurity influencing different components of the emotional response. Specifically, higher scores on attachment anxiety related to higher levels of HPA activation and subjective reports of negative affect and jealousy, whereas higher scores on avoidance led to more proximity and less distance behaviour towards the partner in response to relational stress. The results on attachment anxiety are in line with previous research showing elevated cortisol secretion in anxious individuals in response to attachment threat and thus confirm the role of the anxiety dimension in hyperactivating the stress response (e.g., Diamond et al., 2008; Laurent and Powers, 2007; Pietromonaco and Barrett, 1997). In addition, subjective and cortisol responses were found to converge as a function of female anxiety, indicating that the more anxious women experience concurrent high levels of physical and subjective distress. Such increase in stress reactivity could possibly result from increased anticipatory cognitive appraisal and catastrophic beliefs about the upcoming event (see also Mikulincer and Shaver, 2007). Research has shown that relational threat may evoke ruminative thoughts about potential betrayal, insufficient commitment, lack of relationship exclusivity, and deceit by their relationship partner (Guerrero, 1998; Mikulincer, 1998). Hence, the observed pattern of emotional responding might suggest that anxious individuals show a more rapid onset of emotional responding and/or ineffective strategies for down-regulating emotions. The latter may be indicated by the fact that both subjective and physiological distress levels remained high after the distress induction, which is suggestive of emotional dysregulation and associated with negative health outcomes (Dickerson and Kemeny, 2004). Also important to note is that such a persistent stress response emerged only in anxious women, which could be explained by the fact that women are more responsive to the emotional tone of their relationship and therefore more strongly influenced by interpersonal stressors than men (Kiecolt-Glaser and Newton, 2001).

We do need to mention, however, that it is difficult to differentiate between emotional sensitivity and emotion regulation as a function of attachment based on the emotional output of distress. This implies that we cannot ensure whether a certain output – such as elevated cortisol or heightened subjective distress – represents an overreaction to the stressor right from the onset or a failure to regulate the emotional response once it had been engaged. Hence, we can only speculate about the mediating processes of emotional responding in relation to attachment. Such problems are difficult to avoid given that observable responses (physiological, behavioural, or subjective) can always reflect a variety of psychological processes (Cacioppo and Tassinary, 1990). Unfortunately, we did not measure cognitive mediators of emotional responding such as worrying, catastrophizing, or expectations about the event. Hence, it is not clear whether the emotional responses of anxious individuals can be attributed to reactivity or regulation problems. Future work is needed to disentangle both accounts by providing a more detailed analysis of the psychological state of participants in response to relational threat.

Considering the effect of attachment style on behavioural responses, we failed to observe a relationship between attachment anxiety and proximity behaviour. This fits well with other existing research, indicating that anxious individuals’ tendency to seek proximity towards their attachment figure is thwarted by worries about rejection and doubts about trustworthiness, which generates ambivalence and approach-avoidance conflicts (e.g., Fraley and Shaver, 1998; Simpson et al., 1992). The observed pattern of interrelations between affective and behavioural responses may show some bearing on this point. That is, the more anxious men and women who reported higher levels of negative affect and jealousy in response to distress also displayed more proximity- and distance behaviour towards their partner. In women, attachment anxiety also moderated the relation between cortisol and proximity-distance behaviour, indicating that the more physiological stress they experienced, the more proximity and distance they showed. The display of both proximity and distance behaviour in response to distress may be indicative of an approach-avoidance conflict. Such dilemma may suggest a possible understanding of anxious individuals’ emotional overinvolvement in the face of relational threat. Because their partner may represent a source of comfort and, at the same time, a source of distress, anxious individuals may lack a behavioural coping strategy to down-regulate emotions through proximity seeking. It could be that such ambivalence results in heightened activation of the HPA-axis and greater experiences of negative affect during the distress induction and even during recovery. The present results suggest that analyzing emotional correlates at multiple levels of responding may provide deeper insight into the emotional dynamics underlying attachment anxiety. That is, anxious individuals’ heightened emotional reactivity in combination with a failure to translate their desire for proximity into an unambiguous behaviour could possibly evoke a cascade of emotional responding, which turns the relational stressor into a difficult regulatory challenge. Although we cannot draw conclusions on the direction of the observed relationships, our results point to the central role of proximity seeking in regulating attachment distress, which provides evidence for the normative component of attachment functioning (see Mikulincer and Shaver, 2003).

The results on emotional responding as a function of fearful attachment show parallels with the results on attachment anxiety. Both at the physiological and psychological level, fearful attached women were found to show the highest level of cortisol and jealousy responses to relational threat and also evidenced a steep increase in distress responses throughout the entire experiment. Furthermore, their physiological and subjective affect responses showed the highest convergence. According to attachment theory, individuals scoring high on anxiety and avoidance lack viable coping actions because they fail to achieve any of the goals of the anxious and avoidant attachment strategies (i.e., hyperactivating versus deactivating the attachment system). Such failure might cause a breakdown in their capacity to regulate negative emotions and provoke chronically elevated distress responses (Mikulincer and Shaver, 2003; see also Spangler and Grossman, 1993, on disorganized attachment). Our results are indicative of such heightened stress reaction. Secure women, on the other hand, were found to show the lowest stress reactivity, especially with respect to cortisol. This fits with theoretical ideas on the stress-buffering effect of secure attachment strategies (Nachmias et al., 1996; Mikulincer and Shaver, 2004). Yet, again, it is not clear whether this stress-buffering effect reflects more effective stress-regulatory strategies or whether secure individuals lower their distress reactions by reappraising the relational stressor as a challenge. This would imply that the stress manipulation was less stressful to them. Future work should include measures of dyadic trust and threat appraisals to test the mediating role of such cognitions on distress responses in order to better differentiate between emotional reactivity and regulation in the context of attachment.

The results on attachment avoidance were also in line with theoretical ideas and empirical findings suggesting that avoidant individuals lack the motivation to seek proximity towards their attachment figure (Fraley and Shaver, 1998; Mikulincer and Shaver,
attachment avoidance was most consistently related to proximity-distance behaviour when discussing the threatening event, apparently because only then coping actions are required (Fraley and Shaver, 1998; Simpson et al., 1992). Note, however, that the male participants with higher scores on attachment avoidance also exhibited less proximity behaviour at baseline, which might be explained by the fact that, compared to the women in our study who were mainly psychology students, men were less familiar with and thus more likely to be influenced by the social context of the laboratory.

With regard to physiological responding, no association was found with attachment avoidance, which fits with other research showing that cortisol reactivity does not vary as a function of attachment avoidance (e.g., Diamond et al., 2008; Laurent and Powers, 2007). Although null findings are hard to interpret, the defensive nature of deactivating strategies might provide a possible explanation for the lack of relationship between attachment avoidance and cortisol. According to attachment theory, avoidant strategies operate at the onset of the emotion process, inclining individuals to cognitively disengage from the source of distress (Diamond et al., 2006; Fraley and Shaver, 1997a,b; Fraley et al., 2000a,b). Such a defensive reaction might possibly explain why avoidant individuals appeared physiologically unaffected by our distress induction. That is, we induced relational stress, which has repeatedly been found to evoke a defensive reaction in avoidant individuals (e.g., Mikulincer et al., 2002). Also, our stressor was based on suggestion, which may have elicited cognitively mediated regulatory processes that allow them to deny the importance of the threatening episode and as such limit further processing of unwanted negative affect. The latter may short-circuit attributions of threat, which may then alter the cascade of negative neuroendocrine activation. Note, however, that we can only speculate about such intermediating cognitive processes because no appraisal or attribution measures were included in this study.

An explanation in terms of avoidant defensive reactions is, however, difficult to reconcile with the finding that the more avoidantly attached individuals did report higher levels of subjective distress. This result was rather unexpected because attachment theory predicts that avoidant individuals tend to consciously deny emotional distress in the service of intimacy avoidance (Fraley and Shaver, 1997a,b). Yet, there is growing evidence that avoidant defensive strategies are not always successful in inhibiting subjective experiences of negative emotions and that their defensive denial may collapse depending on the nature and intensity of the stressor. In relation to this, several studies have indeed shown that attachment avoidance, like anxiety, relates to reports of emotional distress, negative mood, and increased threat appraisals (Birnbaum et al., 1997; Ditzen et al., 2008; Mikulincer and Florian, 1995). Analysing the pattern of interrelations across emotional response channels provided further insight into the observed relation between attachment avoidance and subjective affect. Most importantly, we found that women scoring high on avoidance and low on anxiety (i.e., dismissive women) reported higher negative affect while displaying low levels of cortisol, which points to a dissociation between physiological and subjective responses. Such dissociation is commonly observed in research on avoidant affective reactions. In general, evidence on emotional responding in relation to attachment avoidance is inconclusive, with some studies – like the present one – showing no relation with physiological responding. Other studies found decreased (Diamond et al., 2006; Fraley and Shaver, 1997a,b; Fraley et al., 2000a,b) or even increased physiological responding, whether or not in combination with lower self-reported negative affect (Dozier and Kobak, 1992; Feeney and Kirkpatrick, 1996; Roisman, 2007). Yet, despite these inconsistencies, the general pattern of results across studies point to a dissociation between subjective and physiological distress responses in avoidant individuals, which was also the case in the present study. This further indicates the importance of analyzing emotional responses at different levels because it allows inferences about emotional processing based on discrepancies and commonalities across response channels. If anything, dissociations between subjective and bodily changes might have negative consequences in the long run and impair adaptive emotion regulation in the context of interpersonal relationships (see Gross, 2002). Delineating the specific conditions under which attachment avoidance relates to heighten versus decreased physiological and/or subjective distress responses is important to further clarify the impact of attachment avoidance on emotion regulation in the context of interpersonal relationships.

Another important finding is that avoidant individuals reported higher levels of indifference in response to our distress induction, showing some indication of attenuated emotionality. Interestingly, attachment avoidance was also found to moderate the relation between reports of indifference and proximity-distance behaviour, indicating that the more indifference avoidant men and women reported, the less proximity they sought and the more distance they kept regarding their attachment figure. This fits with theoretical descriptions of avoidant individuals as being less affected by relational events and keeping distance as a means to avoid intimacy (Mikulincer and Shaver, 2007). In women, level of attachment avoidance also moderated the relation between proximity-distance behaviour and the other indices of subject affect, namely negative affect and jealousy. Remarkably, we found that the more negative affect and jealousy avoidant women reported in response to distress, the more proximity and distance behaviour they displayed. This pattern of responding shows parallel with the affective and behavioural reactions of anxious individuals, who also showed convergent levels of subjective affect and proximity-distance behaviour. Based on attachment theory, we would have predicted the opposite for avoidant individuals, namely low levels of subjective affect in combination with high distance and low proximity behaviour. Although our finding is difficult to explain from a theoretical point of view, it is reasonable to assume that avoidant women react in a more anxious way when confronted with relational threat because women are supposed to take a leading responsibility in their relationship and are therefore more sensitive to relational issues (see Kiecolt-Glaser and Newton, 2001). The fact that this relational focus was translated in avoidant women’s subjective and behavioural, but not physiological, responses might be explained by the fact that bodily changes are less prone to social desirability concerns than psychosocial variables (Cacioppo et al., 1999).

We also investigated dyadic links within the couple because recent work on emotion regulation has suggested the importance of including dyadic factors in the study of distress reactions (Diamond and Aspinwall, 2003; Kiecolt-Glaser and Newton, 2001). More concretely, it has been suggested that effective emotion regulation within an interpersonal context may depend in part on the availability and supportiveness of the partner. In attachment terms, it can thus be expected that the attachment style of the partner will modulate one’s reactions to distress. This could be confirmed by the present results. In general, we found that the emotional and behavioural responses of both men and women were influenced by their partners’ attachment orientation, though the specific pattern of cross-partner effects varied for men and women. Women with male partners who were securely attached showed the least physiological responding, whereas women with insecure partners displayed the most extreme levels of cortisol reactivity, which in the case of fearful attachment even increased during recovery. This pattern of results fits with theoretical ideas that a relatively secure partner may alleviate distress reactions (Mikulincer and Shaver, 2004). A possible explanation is that secure partners are perceived as more trustworthy, less jealous and more likely to provide sup-
port in the face of relational threat. This could have made our distress induction less stressful to individuals with secure partners. Insecure partners, in contrast, especially the anxious ones, are prone to experience and express jealousy, to ruminate on possible signs of disapproval or rejection, and are emotionally preoccupied with the possibility of rejection (Afifi et al., 2001). The anxious insecure attachment style is associated with a drive to reduce negative affect (Davila et al., 1995) and to pursue the attachment figure to reduce uncertainty (see Mikulincer and Shaver, 2007). This may have rendered their threat induction particularly stressful for participants with insecure partners, especially in women who are assumed to take greater responsibility for their relationship (Kiecolt- Glaser and Newton, 2001). We do, however, lack the exact data to substantiate the mediating role of threat appraisals in determining the observed stress responses.

In men, the attachment style of their partner had no effect on physiological responding, but did impact their behavioural responses, both at baseline and after distress induction. Most importantly, we found that female’s anxiety elicited more proximity behaviour in their partner and, in parallel, men with more anxious and avoidant partners exhibited less distance behaviour in response to relational threat. These results may suggest that men with insecure partners try to reduce their partners’ uncertainty by exhibiting less distance behaviour. Finally, we also found that partners’ avoidance impacted on subjective reports of negative affect in both men and women. However, whereas women with avoidant partners experienced relief during recovery, men showed an increase in negative affect when their partners where high on avoidance. Because such gender differences were not expected theoretically, we can only speculate on the contradictory effect of partners’ avoidance on men and women’s subjective responses and note that further study is warranted. As an overall conclusion on the observed dyadic effects, the present results suggest that attachment insecurity puts couples at risk for emotional maladjustment.

From a more general and theoretical point of view, our findings are remarkably congruent with the original theory of Fraley and Shaver (1998, 2000), postulating that attachment anxiety and avoidance reflect two distinct components that underlie the functional organisation of the attachment system. According to their model, attachment anxiety refers to an appraisal component that influences the experience of distress and insecurity, whereas attachment avoidance corresponds to a behavioural component that is responsible for the orientation of behavioural strategies towards the attachment figure. Drawing on this view, it is thus interesting to note that our general pattern of findings confirms that anxiety and avoidance play a different and unique role in regulating emotion and behaviour. Whereas part of the analyses revealed important information on the basic pattern of emotional responding as a function of attachment style, our analyses on the interrelations across emotional responses shed light on the regulatory strategies underlying anxiety and avoidance. Importantly, the present results provided support for this two-dimensional structure independent from methodological overlap. That is, the relationship between anxiety and physiological responses and between avoidance and spontaneous behaviour cannot be explained in terms of shared method variance or item overlap, which addresses an important methodological weakness of previous research on attachment distress. Furthermore, by combining different measures of emotional responding into one study design, we restricted the influence of other methodological confounds due to variability in the sample, the procedure, or the nature of the stressor.

Although, throughout this general discussion, we did mention a few differences in the emotional reactions of men and women, the basic pattern of attachment-style differences in each of the emotional indicators was fairly comparable between couple members. That is, in both men and women, (1) attachment anxiety was associated with increased cortisol reactivity and concurrent high levels of subjective affect and proximity-distance behaviour, (2) attachment avoidance was associated with behavioural responses after distress and reports of indifference, and (3) both anxiety and avoidance related to reports of heightened negative affect. These findings are congruent with attachment literature in which gender differences are not common (Feeney and Noller, 1996; Schmitt et al., 2003) and also seem to suggest that our stressor is less confounded by gender roles compared to stressors that were used in other research (see Powers et al., 2006). It is interesting to note, however, that when inspecting the general data on emotional responding independent of attachment style, we did find that men displayed greater cortisol reactivity than women. Drawing on the common view that women are more sensitive to relational issues and therefore more likely to be influenced by our threat induction, we would have expected the opposite (see Kiecolt- Glaser and Newton, 2001). On the other hand, there is research suggesting that men experience greater physiological arousal during relational stress than women because men generally prefer autonomy over closeness, which might be compromised when the relationship is under pressure. To cope with such physiological arousal, men may sometimes withdraw from their partner as a protective mechanism (see escape-conditioning model; Gottman and Levenson, 1988). Some indication for these ideas can be found in the present results showing that, in addition to greater physiological reactivity, men do generally display more distance and less proximity behaviour than women.

Despite the strength of adopting a multi-level approach to the analysis of attachment distress responses as a function of attachment style, there are several limitations to this study that need to be addressed. First, the experience of being in the laboratory, not knowing what will happen next, may have elicited anticipatory stress reactions, which compromises our baseline measurement. Note, on the other hand, that most variables did show a significant increase in distress reactivity compared to baseline. Secondly, the present study included only three measurement points for cortisol, which prevented us from examining a more detailed trajectory of stress reactivity and recovery (see Laurent and Powers, 2007; Powers et al., 2006). Third, the observed effects were relatively small, which could partly be accounted for by our relatively small sample size. Fourth, because participants were not preselected based on their attachment style, our sample comprised of relatively secure individuals. Underlying feelings of security may have been responsible for the fact that our participants appraised the experimental manipulation as less stressful than they had expected when entering the laboratory. This could explain in part why cortisol responses to the relational stressor were generally lower than at baseline. Only the combination of higher scores on anxiety and avoidance yielded the expected increase in emotional reactivity to relational stress. Fifth, we studied attachment distress in a sample of college students in dating relationships, leaving unexplored whether the observed effects may generalize to partners in more steady relationships. Sixth, as already mentioned several times before, we refer to a common problem in attachment research that has to do with the fundamental conflation between emotional reactivity and regulation. Given that attachment system activation depends on the subjective appraisal of threat, it becomes difficult to determine when individuals begin to engage in self-regulatory efforts and when exactly the emotional response reflects an earlier onset of emotions. Although we regard the induction of an attachment-specific stressor as beneficial to a relationship-unrelated threat, the influence of attachment style on the appraisal of the stressful event might impair a clear interpretation of emotion regulation versus reactivity in response to our relational stressor. Unfortunately, we did not include measures of cognitive mediators such as threat appraisals and attributions that could allow differentiating between a reactivity or regulation account of our findings. And finally, we did not include general factors that could...
impact physiological reactivity, or relationship variables (such as relational satisfaction) that may moderate the effects of attachment differences on stress reactivity.

On a final note, we want to mention that, although differences among the insecure dimensions were less clear than would have been expected based on attachment theory, we did obtain some indication that attachment anxiety and avoidance represent two functionally distinct components. Furthermore, we demonstrated that self-reported attachment anxiety and avoidance related to relatively automatic indices of emotion regulation (i.e., physiological and behavioural responses), which further supports the validity of the attachment construct. Hence, studying attachment responses at different levels of analysis has proven its usefulness for deepening our understanding on the emotional dynamics underlying attachment functioning.

Acknowledgements
We thank Lies Van Deursen for her help with collecting the data and Tessa Van Puyenbroeck for her help with coding the behavioural observations.

References


