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Physiological evidence for repressive coping among avoidantly attached adults

Lisa M. Diamond, Angela M. Hicks, & Kimberly Otter-Henderson

University of Utah

ABSTRACT

Research suggests that the quality of childhood attachments to caregivers influences the development of capacities and strategies for emotion regulation. Avoidantly attached individuals are characterized by emotion-regulation strategies involving the suppression of negative thoughts and feelings. Psychophysiological research on repressive coping suggests that these strategies might be associated with patterns of heightened and escalating sympathetic nervous system reactivity in the absence of correspondingly heightened self-reported affect. The present study tested this hypothesis by subjecting 148 adults to psychological stressors and discussions of attachment-related issues while monitoring their skin conductance level (SCL). Attachment avoidance – but not anxiety – was associated with heightened SCL reactivity to all tasks, especially among women, as well as escalation in reactivity. Additionally, on one stressor avoidance was associated with greater disassociation between subjective and physiological responses. These results have implications for understanding the influence of attachment style on cognitive and physiological aspects of emotion regulation.

KEY WORDS: attachment style • avoidance • psychophysiology • skin conductance • repressive coping

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Relationship researchers have turned increasing attention to the effects of close social ties on physical health over the life span, and the mechanisms through which relationship experiences shape physiological functioning (Ryff & Singer, 2001; Uchino, Cacioppo, & Kiecolt-Glaser, 1996). Childhood attachment relationships figure prominently in this regard. An accumulating body of research (reviewed in Diamond & Hicks, 2004; Repetti, Taylor, & Seeman, 2002) demonstrates that secure attachments formed with caregivers play critical roles in the development of children's capacities for *emotion regulation*, typically defined as the process by which individuals modulate their positive and negative emotional responses to internal and external stimuli (Thompson, 1994). Early caregiving relationships influence not only cognitive-behavioral aspects of emotion regulation, but physiological processes as well, 'tuning' the brain's sensitivity to stress (for example Glaser, 2000; Meaney, 2001) and the body's capacity for managing stress-related metabolic demands (Porges, Doussard-Roosevelt, & Maiti, 1994). These attachment-based patterns of emotion regulation are thought to remain relatively stable over the course of development, suggesting important links between *adult* attachment style and health-related physiological processes. The present research examines this issue by investigating whether adults with high levels of attachment avoidance show patterns of sympathetic nervous system reactivity that are characteristic of 'repressive coping,' involving a potentially detrimental combination of low *subjective* reactivity despite escalating *physiological* reactivity.

Attachment style and the regulation of negative emotions

Attachment styles have historically been conceptualized as trait-like expectations concerning the responsiveness of attachment figures (Ainsworth, Blehar, Waters, & Wall, 1978; Hazan & Shaver, 1994), yet they have been increasingly viewed as indexing different capacities and strategies for emotion regulation (reviewed in Mikulincer, Shaver, & Pereg, 2003). Briefly, infants who received sensitive and responsive 'external' emotion regulation from their caregivers are viewed as having successfully internalized the ability to regulate distress under most circumstances, manifested in adaptive cognitive and behavioral coping strategies and more frequent positive emotions (Mikulincer et al., 2003; Simpson, Rholes, & Nelligan, 1992). In contrast, individuals whose caregivers did not provide for reliable and effective emotion regulation are thought to sustain developmental deficits in their own regulatory capacities, and to develop suboptimal strategies for regulating distress. These characteristics are thought to remain relatively stable, and to manifest themselves in distinct patterns of emotional responding in adulthood. Specifically, *anxiously* attached individuals tend to show heightened and sustained negative emotionality, whereas *avoidantly* attached individuals tend to minimize, suppress, or dismiss negative emotions (Allen, Moore, Kuperminc, & Bell, 1998; Fraley

& Shaver, 1997).[1] These patterns have been observed in response to everyday events and interactions (Pietromonaco & Feldman-Barrett, 1997; Tidwell, Reis, & Shaver, 1996) as well as naturally occurring (Magai & Cohen, 1998; Mikulincer, 1998) or laboratory-induced stressors (Mikulincer, 1998; Rholes, Simpson, & Orina, 1999). Furthermore, they have distinct and well-documented implications for multiple aspects of relationship behavior and functioning (see reviews in Collins & Read, 1990; Collins, Cooper, Albino, & Allard, 2002; Feeney, 1999; Simpson, Rholes, & Phillips, 1996), especially in stressful circumstances (Simpson & Rholes, 1994; Rholes, Simpson, & Stevens, 1998). Specifically, avoidance is associated with less frequent support-seeking behavior from relationship partners in times of distress (Collins & Feeney, 2000; Simpson, Rholes, & Nelligan, 1992), as well as less support *provision* to partners in distress (Feeney & Collins, 2001). In contrast, attachment anxiety is associated with greater expressions of anger and hostility during conflicts with partners (Simpson et al., 1996), and more overt distress and anxiety expressed to partners in anticipation of physical separations from them (Fraley & Shaver, 1998).

Because the heightened experiences of negative affect characteristic of attachment anxiety are demonstrably related to detrimental patterns of immune, autonomic, and endocrine functioning (Kiecolt-Glaser, McGuire, Robles, & Glaser, 2002; Mayne, 1999; Repetti et al., 2002; Ryff & Singer, 2001), one might expect more negative health consequences associated with attachment anxiety than attachment avoidance. Overall, there has been little psychophysiological research on adult attachment that might directly address this question (see review in Diamond, 2001). Yet support for this perspective comes from a handful of studies that have found heightened autonomic nervous system stress reactivity (Carpenter & Kirkpatrick, 1996; Feeney & Kirkpatrick, 1996; Mikulincer, 1998) and poorer parasympathetic nervous system regulation (Diamond & Hicks, 2005) among anxious individuals.

As for avoidant individuals, one might surmise that their *attenuated* negative emotionality (Collins, 1996; Feeney, 1995, 1999; Mikulincer, 1998; Simpson, 1990) is accompanied by similarly attenuated physiological reactivity, perhaps protecting their bodies from the detrimental effects of sustained stress reactivity over time. This is consistent with the notion that the emotion regulation strategies of avoidant individuals are 'preemptive,' involving disengagement of attention from distressing experiences *before* negative affect has been encoded and experienced (both subjectively and physiologically). Support for this view comes from research in which individuals listened to an emotional, attachment-relevant story, and were subsequently tested for immediate recall and rates of forgetting (Fraley, Garner,

1. A random, representative study utilizing a categorical measure of attachment style (in which individuals had to pick one and only one prototype that best characterized them) found that 11% of adults identified with the anxious prototype and 25% with the avoidant prototype (Mickelson, Kessler, & Shaver, 1997).

& Shaver, 2000). Avoidant individuals recalled less information about the story, but did not subsequently forget this information at a faster rate. The authors interpreted these findings to suggest that avoidant individuals had directed their attention away from the story while hearing it, therefore encoding less distress-related information, rather than suppressing this information after the fact. Additional support for the preemptive view of avoidance comes from a study (Fraley & Shaver, 1997) in which avoidant individuals' use of attentional disengagement appeared successful in decreasing thoughts of romantic abandonment *and* concurrent skin conductance level (SCL) a widely used measure of sympathetic nervous system reactivity to strong emotional activation (see review in Dawson, Schell, & Filion, 2000).

Avoidance as repressive coping

Other research, however, indicates that the emotion-minimizing strategies of avoidant individuals do not successfully attenuate their physiological reactivity. For example, Mikulincer (1998) found that avoidant individuals showed significant heart-rate reactivity to an experimental anger induction, despite the fact that they did not report high anger. Other studies have detected significant physiological reactivity among avoidant individuals who were asked to speak about childhood attachment experiences during the Adult Attachment Interview (Roisman, Tsai, & Chiang, 2004), or who were forced to anticipate a laboratory stressor in the presence of their romantic partner (Carpenter & Kirkpatrick, 1996). These studies suggest that avoidance is not necessarily characterized by *low* reactivity, but rather by *disassociations* between the subjective and physiological manifestations of reactivity.

In the social-psychophysiological literature, such disassociation had been previously attributed to *repressive coping*. As far back as 1966, Hare (1966) identified 'repressors' as individuals who responded to impending threats with thought suppression, but who nonetheless showed elevated sympathetic nervous system activity (measured via SCL). SCL has been widely used in studies of repressive coping, given its well-documented associations with both conscious and unconscious experiences of anxiety and emotional reactivity (Dawson et al., 2000; Freedman, 1984; Yoshino, Kimura, Yoshida, Takahashi, & Nomura, 2005). Gudjonsson (1981), for example, found that repressors showed elevated SCL in the absence of self-reported emotional distress, and characterized these individuals as highly defensive. Brosschot and Janssen (1998) validated the repressive pattern of dissociation between high SCL reactivity and low self-reported distress using *continuous* monitoring of individuals' subjective and physiological states during the presentation of negative emotional movie excerpts. Their findings suggested that the dissociation between repressors' subjective and physiological stress responses occurs during the emotional experience itself, and does not represent poststressor denial of one's prior affective state. Thus, it is not that avoidant individuals are misrepresenting their subjective feelings, but that higher-order processes of cognitive and emotional suppression appear to be fundamentally more effective in minimizing *subjective* than *autonomic* reactivity (see Leventhal, 1991). Additionally, the process of suppressing negative emotions and redirecting attentional resources appears to be somewhat taxing in and of itself. For example, Mikulincer, Birnbaum, Woddis, and Nachmias (2000) found that when avoidant individuals were subjected to cognitive load, they no longer showed their characteristic pattern of disengaging attention from emotionally relevant stimuli. Thus, the effort expended on thought suppression might actually *exacerbate* stress.

Clearly, there is conflicting evidence regarding whether avoidant individuals are able to circumvent the entire psychobiological stress response through preemptively redirecting their attention, or whether their use of repressive coping *after* distress has been triggered in order to regulate its subjective – but not physiological – manifestations. Importantly, these two strategies have notably different implications for long-term health. Specifically, if avoidant individuals are successful in preempting distress altogether, one might expect them to show relatively positive health outcomes over the life span as a result of regularly circumventing both the subjective and physiological concomitants of sustained negative emotionality (Kiecolt-Glaser et al., 2002; Repetti et al., 2002; Ryff & Singer, 2001). Yet if avoidant individuals regularly employ repressive coping as a dissociative emotion-regulation strategy, their chronically unregulated physiological reactivity may expose them to health risks over the long term. On this point, the fact that repressive coping effects have been consistently shown with measures of sympathetic nervous system activation is particularly notable, as sustained sympathetic nervous system activation has proven to be specifically associated with detrimental long-term patterns of neuroendocrine and immunological response (Cacioppo et al., 1995; Kamarck & Jennings, 1991).

Of course, one potential explanation for the fact that extant research has found evidence for both the preemptive and dissociative perspectives is that avoidant individuals might use both strategies, only under different conditions. Preemptive strategies might be the ‘first line of defense,’ but when attentional resources are taxed, or when negative emotions are particularly intense and/or sustained, avoidant individuals might be forced to rely on repressive coping to minimize distress. If so, one might expect that avoidant individuals faced with sustained stress will not only show significant physiological reactivity, but might actually show *escalation* in physiological reactivity as the stressor continues, and as the process of suppressing negative thoughts and feelings becomes cumulatively more taxing. The present study directly examines this possibility.

The current study

This study investigates whether avoidantly attached individuals show a pattern of *heightened and escalating* sympathetic nervous system reactivity (as measured by skin conductance level) in response to sustained exposure to a series of emotional tasks, beginning with tasks eliciting attachment-related thoughts and feelings and progressing to tasks eliciting psychological stress. We specifically included tasks designed to elicit *attachment-relevant* thoughts and feelings because prior research had indicated that avoidant individuals are particularly likely to suppress, dismiss, and deny such thoughts and feelings (Fraley, Garner, & Shaver, 2000; Fraley & Shaver, 1997), and not simply generalized stress and negative emotions. Thus, inclusion of the attachment-relevant tasks was expected to provide a more comprehensive investigation of the potential suppression patterns of avoidant individuals and their physiological manifestations.

We predicted that avoidant individuals would show higher SCL reactivity than low-avoidant individuals (Hypothesis 1) and steeper increases in reactivity over the course of the assessment (Hypothesis 2). The prediction of escalation reflects our expectation that as avoidant individuals are confronted with a sustained series of emotional laboratory tasks, the accumulating demands of emotional suppression will progressively magnify their reactivity. This hypothesis is also supported by research demonstrating that when individuals who have actively suppressed thoughts are faced with subsequent intrusions of these thoughts, they show progressive and prolonged elevations in SCL response (Wegner, Shortt, Blake, & Page, 1990). Thus, we anticipate that sustained exposure to a combination of attachment-relevant and distressing tasks will necessarily create such 'intrusions,' and will further contribute to a pattern of progressively increasing sympathetic nervous system reactivity. With regard to self-reported distress, we expect that avoidant individuals will report neither heightened nor escalating patterns of subjective distress (Hypothesis 3), and that their self-reported distress will be more disassociated from their physiological reactivity than among low-avoidant individuals (Hypothesis 4).

Method

Participants

Participants were 74 cohabiting heterosexual couples (thus, 148 individuals total), all of whom had been together for at least 2 years, who were part of a larger study of day-to-day proximity and physical separation in cohabiting couples. Participants ranged in age from 20 to 53, with a mean of 28 (SD = 7.0). Mean relationship length was 6 years (SD = 4.88) and 76% of couples were married. Couples were recruited through newspaper advertisements and electronic messages distributed to academic departments at several local universities. All couples who participated in the study received US$100. Couples with low levels of relationship satisfaction (as assessed by Hendrick, 1988) were excluded from the study.

Measures

All participants completed the *Experiences in Close Relationships* (ECR) measure of attachment style (Brennan, Clark, & Shaver, 1998), with the revisions recommended by Fraley, Waller, & Brennan (2000). This measure is a 33-item scale that yields two continuous 7-point scale ratings – one for attachment anxiety and one for attachment avoidance (see Brennan et al. (1998) for further discussion of the independence between these two types of attachment insecurity). A sample item for anxiety is 'I'm afraid I will lose my partner's love,' and a sample item for avoidance is 'I prefer not to show a romantic partner how I feel deep down.' The mean for anxiety was 2.30 (SD = .87) and the mean for avoidance was 2.16 (SD = .88), and Cronbach's alphas were .87 for both scales. Consistent with prior research, both scales were negatively associated with the aforementioned screening measure of relationship satisfaction, $r = -.46$ and $-.75$, respectively, both p values < .01. There was a trend for females to be higher on attachment anxiety than males, $t = 1.97$, $p < .10$, but there were no gender differences in avoidance. Trait anxiety was also measured with the State-Trait Anxiety Inventory (Spielberger, 1983), a 20-item, 4-point scale. Mean trait anxiety was 1.79 (SD = .42) and Cronbach's alpha for this measure was .89. At different points in the assessment (described below) participants also completed a 10-item, 4-point measure of *state* anxiety in order to assess their immediate subjective response to the experimental manipulations. Cronbach's alpha on this measure was .82 and mean baseline anxiety was 1.36 (SD = .52). Henceforth, the state measures will be referred to as 'state distress' rather than 'state anxiety' in order to avoid confusion with attachment anxiety. Correlations among the major study variables are presented in Table 1.

TABLE 1
Correlations among study variables

	1	2	3	4	5	6	7	8	9
1. Female's attachment anxiety									
2. Female's attachment avoidance	.52***								
3. Female's trait anxiety	.55***	.35**							
4. Female's baseline state anxiety	–.01	.01	–.08						
5. Female's baseline SCL	–.01	–.16	.11	–.07					
6. Male's attachment anxiety	.20	.35**	.27*	–.10	.02				
7. Male's attachment avoidance	.23	.21	.15	.04	.13	.47***			
8. Male's trait anxiety	.34**	.21	.18	–.01	.05	.39**	.33**		
9. Male's baseline state anxiety	.20	.18	.22	.00	–.09	.07	.13	.33**	
10. Male's baseline SCL	.09	.06	–.18	.14	.20	.14	.26*	.19	.06

*p < .05; **p < .01; ***p < .001.

To measure skin conductance, James Long Company (Caroga Lake, NY) silver/silver chloride skin conductance electrodes were placed on the medial phalanges of the first and second fingers of the participant's nondominant hand and fixed in place with velcro cuffs. The area of skin to be in contact with the electrode was delineated with James Long Company double-sided adhesive collars with a 1 cm diameter hole. James Long Company skin conductance gel consisting of a citrate salt in propanediol carboxylate polymer base and having a pH of 6.25 was used as the electrolyte medium. A 0.5 V root mean square 30 Hz sine wave excitation signal was applied to the skin and conductance was recorded with a low-pass filter of 10 Hz. Readings were amplified and filtered through a James Long Company 4-channel bioamplifier, model LMD-04. All physiological signals were fed into an A/D and stored on an IBM-compatible computer. The sampling rate was 1000 Hz per channel. Data analysis was implemented with the James Long Company PHY General Physiology Analysis System software, which permits visual inspection and manual editing of artifacts. Approximately .08% of data were edited for artifacts using interpolation of adjacent points.

Procedures

All participants were instructed to refrain from eating, smoking cigarettes, or consuming caffeinated beverages within 2 hours of the experiment (verified at the laboratory). After undergoing informed consent, one partner was escorted to a waiting room down the hall while the other partner washed his/her hands with Ivory detergent. He/she was then fitted with the physiological equipment (described above) and seated on a small couch. Participants were instructed to sit quietly and relax for 5 minutes to get adjusted to the physiological equipment. Then they were instructed (via intercom) to take a nearby notebook and clipboard, and rate their liking of various landscape photographs. This 'vanilla baseline' procedure, in which participants' attention is engaged in a restful, pleasant task during the baseline assessment, is standard practice in psychophysiological research (Jennings, Kamarck, Stewart, & Eddy, 1992). The baseline assessment lasted 3 minutes, after which participants filled out the baseline state distress measure, and then engaged in a paced breathing task for 3 minutes to facilitate accurate measurement of other physiological indices (reported elsewhere).

Next, the first attachment-related task (denoted the 'relationship description task') was initiated. Participants were instructed as follows, through the intercom: '*Okay, now we want to assess your physiology while you're speaking, so we're just going to have you answer some questions out loud. To start, just give us a description of your current relationship with your partner. Please speak continuously, and try not to pause*.' After one minute, the experimenter said, '*Okay, now list three different adjectives that describe your relationship with your partner.*' After the participant replied, the experimenter prompted the participant to provide a specific example demonstrating how each adjective applied to their partner. This task, which lasted a total of approximately 2 minutes, was designed as a brief, romantic-relationship-specific adaptation of the Adult Attachment Interview (for background on underlying theory and methodology of the Adult Attachment Interview, see Hesse, 1999), which similarly asks individuals to provide descriptive adjectives of their mother or father and to provide detailed examples substantiating the adjective they chose. During the next task (denoted the 'separation discussion'), participants were asked to describe their thoughts and feelings regarding either an anticipated or hypothetical physical separation from the partner, such as a work-related trip (ancillary analyses detected no differences between descriptions of hypothetical vs. anticipated separations). This task lasted for approximately 1 minute. Both of these tasks were selected because they require the participant to actively reflect on attachment-related concerns about relationship quality (during the relationship description) and proximity/abandonment (during the separation discussion), both of which should prompt attachment-related worries among insecurely attached individuals. Thus, although these tasks are not conceptualized as stressors on par with the three ensuing stress tasks (described below), they are ideal for triggering precisely the sorts of attachment-relevant thoughts and feelings that avoidant individuals have been shown to suppress and deny, and which should therefore elicit SCL reactivity.

The next three tasks were standard psychological stressors that were unrelated to attachment concerns. The first task (denoted the 'math task') involved performance of serial subtraction, a widely used psychological stressor that is often combined with negative performance feedback in order to increase its stressfulness (Earle, Linden, & Weinberg, 1999; Lai & Linden, 1992). Participants began with the number 9000 and repeatedly subtracted 13. They were instructed to perform these subtractions mentally, without speaking, but every 20 seconds they were signaled to report the last number they reached. Prior to beginning the task, they were told that their performance was being scored for speed and accuracy, and that if they made too many mistakes they would have to go back and repeat some of the subtractions. Approximately every 90 seconds the experimenter interrupted the participant and reminded him/her that both speed and accuracy were important, and at three different points the participant was asked to go back to a previous number (implying poor performance). This task lasted approximately 7 minutes. Participants completed a state distress form immediately after finishing, during a 1-minute recovery period.

Next, the 'speech task' was initiated. This performance task was modeled on similar evaluative tasks that have been found to reliably elicit negative affect and anxiety (Dickerson & Kemeny, 2004; Kirschbaum, Pirke, & Hellhammer, 1993). Participants were instructed to imagine that they were applying for a job and that they had to prepare a speech convincing the personnel committee of their qualifications. They were instructed to deliver the speech into a camera that was placed directly in front of them (and which was conspicuously adjusted and focused by the experimenter to heighten the participant's awareness of being evaluated) and were told that their performance would be evaluated using a scale widely used by Human Resource Managers to screen potential job candidates. They were warned that they would be interrupted with difficult questions in order to judge how effectively they were able to respond to such challenges. Several minutes after the participants began speaking, the experimenter interrupted them and asked them to explain apparent falsehoods on their CVs. After this 4–5-minute task, participants completed another round of state distress forms during a 1-minute recovery period.

Finally, participants completed an 'anger recall' task, during which they were instructed to speak for approximately 2 minutes about a recent experience or conflict that made them extremely angry, frustrated, or stressed. The participant was instructed to describe what happened in detail, and exactly how he/she felt, as realistically as possible, attempting to recreate that state of mind. This task has been found to be a reliable elicitor of anger and anxiety in prior research

(Anderson & Lawler, 1995; Siegman & Snow, 1997). Afterwards, participants completed the final round of state measures, and were debriefed and unhooked. They were then escorted to a waiting room and the same procedure was completed with their partners (couples had no opportunity to discuss the tasks during the experimental session). Participants filled out the questionnaire measures at the end of the session, and were debriefed and paid by check.

Results

Model definition

The multivariate module of HLM, known as HMLM (Bryk & Raudenbush, 1992), was used to permit simultaneous estimation of multilevel growth models for the female and male partner of each couple, thereby controlling for within-couple dependency while also allowing for direct statistical comparisons of model coefficients between female and male members within couples (because parallel regression equations are computed simultaneously within each dyad, the total sample size is the number of individuals rather than the number of couples). To structure such a model, the Level 1 equation contains the dependent variable – reactivity in SCL (computed as task level minus baseline,[2] following Llabre, Spitzer, Saab, Ironson, & et al., 1991) – modeled solely as a function of dummy coded variables representing either the female or male partner:

$$\text{SCL reactivity}_{\text{task i, couple j, gender g}} = \pi_{1j}(\text{Male}) + \pi_{2j}(\text{Female}) + e_{ijg}$$

Note that this equation does not contain an intercept, so that the coefficients for the male/female dummy codes, π_{1j} and π_{2j}, represent the population true scores for the female and male partners of couple j on task i.

At Level 2, the growth trajectories for each partner's skin conductance over the five consecutive tasks are estimated with the following model (one for the female partner and one for the male partner): $\pi_{1j} = \beta_{10j} + \beta_{11j}(\text{Task}) + r_1$. The coefficient β_{11} represents the slope of the trajectory in SCL reactivity from the first through to the fifth task. The intercept term β_{01} represents reactivity level when 'task' = 0 (i.e., the first task). Analyses were repeated with different tasks coded as the zero-point in order to calculate a series of single-degree-of-freedom contrasts testing gender and attachment style effect on each specific task.[3] At Level 3, the intercepts and growth coefficients for SCL reactivity were

2. Change scores are commonly used in psychophysiological research (rather than raw scores corrected for baseline values, also known as 'residualized' scores) because of their greater interpretability (i.e., straightforward deviations from baseline), and because they have been shown to yield results that are statistically equivalent to residualized scores (Llabre et al., 1991). Another advantage to using change scores is that one can still enter the baseline values as covariates to control for the fact that physiological reactivity measures tend to be negatively correlated with baseline values (Benjamin, 1967). Nonetheless, to ensure that the present analyses were not distorted by the use of change scores, all analyses were repeated using actual SCL values as dependent variables instead of change scores, and retaining the baseline values as level 3 covariates. None of the results was changed.

3. The growth curve modeling format does not provide for easily interpretable examination of task-by-task differences. Because such differences were not the primary focus of the study, we did not develop specific hypotheses about them; yet for descriptive purposes, we examined

modeled as a function of individual-level variables and covariates: Attachment anxiety (Anx), attachment avoidance (Avd), participant's age, and participant's baseline SCL. Following standard practice with physiological reactivity measures (see Benjamin, 1967), baseline SCL was included as a Level 3 covariate because it was correlated with task-minus-baseline reactivity scores. Excluding baseline measures as covariates in such cases can result in misspecification of effects. The Level 3 model for each partner therefore took the following form:

$$\text{Intercept: } \beta_{100j} = G_{100j} + G_{101j}(\text{Anx}) + G_{102j}(\text{Avd}) + G_{103j}(\text{Age}) + G_{104j}(\text{Baseline SCL})$$

$$\text{Slope of Increase: } \beta_{110j} = G_{110j} + G_{111j}(\text{Anx}) + G_{112j}(\text{Avd}) + G_{113j}(\text{Age}) + G_{114j}(\text{Baseline SCL})$$

This particular type of multivariate multilevel model, in which the Level 1 equation creates population true scores for each member of the couple, uses an unrestricted Level 1 variance structure, which allows for a unique error variance for the males and females and a covariance between them. This structure is analogous to computing two multilevel models and allowing the DVs to be correlated at a constant amount over time. The model fit is parallel to a standard HLM model in which the error variance is fixed over time. All Level 3 continuous independent variables were centered before inclusion. Additional models were computed to test whether the *partner's* anxiety and avoidance – or interactions between one's own and one's partner's anxiety and avoidance – contributed to the model, and they did not. Interactions between one's own anxiety and avoidance were also tested, and were not significant. Interactions between gender and attachment style were tested by computing single-degree-of-freedom contrasts (tested with chi-square statistics) testing whether the anxiety or avoidance coefficients were significantly different between females vs. males. In cases where there were no significant gender differences, we use a joint contrast with two degrees of freedom to produce an overall test of the significance of the attachment effect, combining across gender. This strategy was also used to test for gender differences in task-specific intercepts, representing gender differences in reactivity.

Gender and attachment style effects on SCL reactivity

Correlations among SCL reactivity and self-reported reactivity to all of the laboratory tasks (and correlations between each reactivity measure and attachment style) are reported in Table 2. As noted above, by changing the zero point for the task variable we were able to test for gender and attachment style

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them using a traditional repeated-measures analysis. We found significant differences in reactivity between the five tasks, Wilks's lambda = .76, $p < .001$, but no interactions between gender and the overall task effect, Wilks's lambda = .96, $p <$ ns. Follow-up contrasts detected significant differences between each task and the subsequent task, as well as differences between each task and the mean reactivity to all five tasks, all p values < .05. None of these differences varied as a function of gender. We conducted parallel analyses to examine task differences in self-reported reactivity. In this case no overall task-by-task differences were detected, Wilks's lambda = .88, $p =$ ns. Although there was a significant interaction between task and gender, Wilks's lambda = .96, $p < .05$, the follow-up tests of task differences repeated within each gender failed to detect significant task differences.

TABLE 2
Correlations among reactivity measures

	1	2	3	4	5	6	7	8	9
1. SCL reactivity to relationship description									
2. SCL reactivity to separation discussion	.90***								
3. SCL reactivity to math task	.71***	.86***							
4. SCL reactivity to speech task	.63***	.79***	.93***						
5. SCL reactivity to anger task	.60***	.78***	.90***	.97***					
6. Self-reported distress to math task	.02	.11	.18*	.68***	.22**				
7. Self-reported distress to speech task	.09	.12	.08	.10	.13	.47***			
8. Self-reported distress to anger task	.01	.06	.04	.01	.04	.50***	.48***		
9. Attachment anxiety	.11	.12	.08	.06	.07	.14	.09	.12	
10. Attachment avoidance	.23**	.25**	.28**	.30**	.28**	.30**	.04	.05	.46**

*$p < .05$; **$p < .01$; ***$p < .001$.

effects on SCL reactivity to each of the laboratory tasks. There were no overall gender differences in reactivity, but there was a significant interaction between gender and attachment avoidance across tasks. Specifically, avoidance was consistently related to greater SCL reactivity, as predicted by Hypothesis 1 (represented by the contrasts testing the joint significance of the avoidance coefficients, in the last column of Table 3), and this effect was significantly more pronounced among female partners (represented by the contrasts testing the gender difference in the coefficients, in the third column of Table 3). Interestingly, we found that among both males and females there was a significant association between greater attachment anxiety and *lower* SCL reactivity for the anger task, joint $\chi^2 = 8.5, p < .05$, and a trend-level effect in the same direction for the speech task, joint $\chi^2 = 5.30, p < .10$.

We had also predicted that avoidance would be related to a steeper progressive *increase* in reactivity from the first through to the fifth task (Hypothesis 2), represented by the coefficient for the linear trend effect of 'task,' as explained above. This hypothesis was confirmed. As shown in Table 3, there was a significant linear trend in reactivity across both males and females, joint $\chi^2 = 40.48$, $p < .00001$, and this trend was more pronounced among those with higher avoidance, joint $\chi^2 = 11.21, p < .001$. The avoidance effect is depicted graphically in

TABLE 3
Effects of gender and attachment style on skin conductance reactivity

	Female coefficient	Male coefficient	χ^2 for gender difference	χ^2 for joint significance test
Reactivity to relationship description	1.89***	1.60***	.71	198.4***
Moderating effect of anxiety	.02	–.10	.28	.38
Moderating effect of avoidance	.55**	.15	3.20[t]	4.02*
Reactivity to separation discussion	2.19***	1.78***	1.49	223.24***
Moderating effect of anxiety	–.13	–.11	.01	1.19
Moderating effect of avoidance	.69***	.23	4.02*	20.93***
Reactivity to math task	2.50***	1.95***	2.06	224.69***
Moderating effect of anxiety	–.28[t]	–.12	.37	3.31
Moderating effect of avoidance	.84***	.32[t]	4.15*	23.73***
Reactivity to speech task	2.80***	2.13***	2.28	210.78***
Moderating effect of anxiety	–.42*	–.13	.98	5.30[t]
Moderating effect of avoidance	.98***	.40*	3.83*	23.61***
Reactivity to anger task	3.10***	2.30***	2.29	191.74***
Moderating effect of anxiety	–.57*	–.14	1.56	6.65*
Moderating effect of avoidance	1.13***	.49*	3.39[t]	22.32***
Linear trend across tasks	.30***	.17***	1.21	40.48***
Moderating effect of anxiety	–.15**	–.01	4.18*	8.50*
Moderating effect of avoidance	.14*	.09*	.70	11.21**

[t] $p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$.
Note. The tests for gender differences have 1 degree of freedom, and the joint significant tests have 2 degrees of freedom. All models included age and baseline skin conductance as covariates.

the first panel of Figure 1, which display the adjusted means for SCL reactivity for each of the five tasks, stratified by high/low avoidance groups (1 *SD* above or below the mean). Note that this effect cannot be attributed to baseline differences in SCL, as there was no association between avoidance and baseline SCL (shown in Table 1), and as these analyses also statistically adjusted for baseline levels. To ensure that the effect was not attributable to the fact that the first two tasks (the relationship description and the separation discussion) were not conceptualized as stressors, and hence elicited lower levels of reactivity than the subsequent three tasks, we recomputed the analyses using only the math, speech, and anger tasks, and found that the association between avoidance and escalating reactivity remained unchanged.

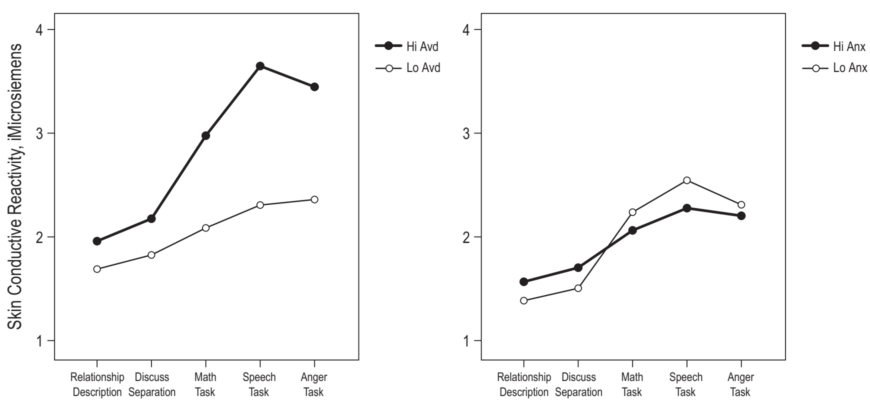
In contrast to the gender-avoidance interactions noted earlier for task-specific reactivity, the avoidance effect on the linear increase in reactivity did not differ between men and women. We also detected a significant interaction between gender and anxiety in predicting the linear change in reactivity across the tasks. Specifically, we found that among females, greater anxiety was associated with *less* of an increase in reactivity, $G = -.15$, $p < .01$. These results are depicted graphically in the second panel of Figure 1, which displays the adjusted means for SCL reactivity stratified by high/low anxiety groups (1 *SD* above or below the mean). This graph presents the data for both males and females, although as noted earlier, the negative association between anxiety and escalating reactivity is only significant among females.

Because previous research suggests that repressive coping involves a combination of defensiveness and trait anxiety (Gudjonsson, 1981), we repeated all analyses after including trait anxiety as a covariate, as well as interactions between trait anxiety and the attachment dimensions. There were no significant effects of trait anxiety, and no significant interactions with attachment anxiety or avoidance.

Gender and attachment style effects on self-reported reactivity

We conducted parallel analyses of individuals' self-reported distress in response to the three stress tasks. As with the skin conductance data, we represented reactivity in terms of task-baseline difference scores, and because reactivity values were correlated with baseline values, we also included baseline anxiety as a covariate at Level 3. The structure of the models was identical to the skin conductance models, detailed earlier, except that there were only three tasks. We did not assess subjective distress after the relationship description or the separation discussion tasks because although these tasks were expected to

FIGURE 1
Adjusted means for skin conductance reactivity to laboratory tasks among participants 1 *SD* above and below mean for attachment avoidance, and 1 *SD* above and below mean for attachment anxiety.



make attachment-related concerns salient, they were not expected to elicit significant distress and anxiety.

The results of these analyses are presented in Table 4. Turning first to the task-specific effects, we found significant distress reactivity among both males and females for each of the tasks (see joint contrasts in the fourth column of Table 4) but females were consistently more reactive than males, $\chi^2_{\text{math}} = 7.14$, $p < .007$, $\chi^2_{\text{speech}} = 10.11$, $p < .002$, $\chi^2_{\text{anger}} = 5.5$, $p < .05$. There were no attachment style effects on reactivity to any of the tasks, and no interactions between gender and attachment style. Contrary to the case of skin conductance, there was a significant linear *decrease* in reactivity from the math task to the anger task (see coefficients in Table 3) that did not vary significantly as a function of gender, joint $\chi^2 = 23.10$, $p < .001$. This is depicted in Figure 2, which shows the adjusted means for distress reactivity to the math, speech, and anger tasks, stratified by gender.

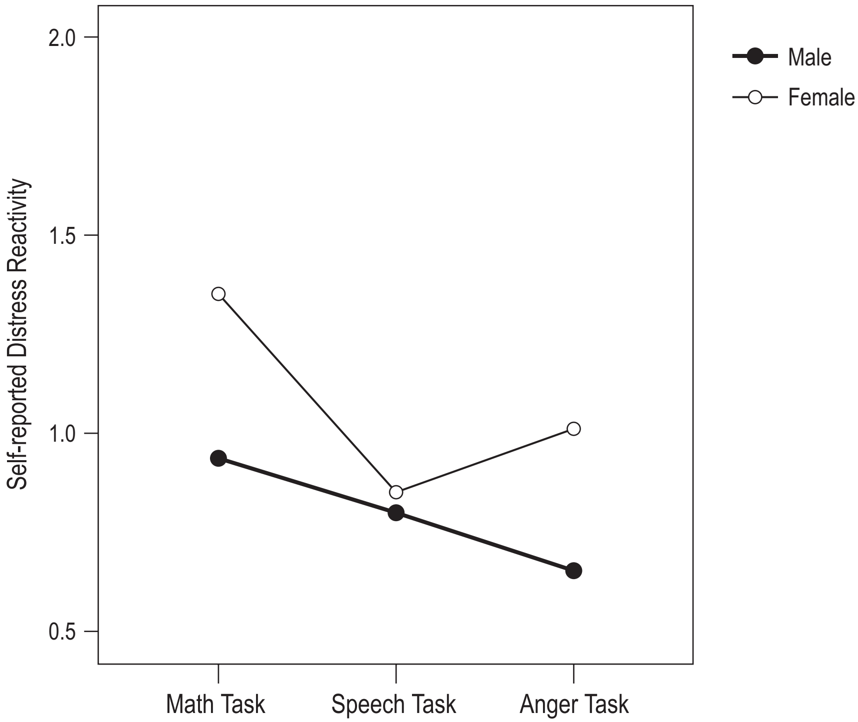
Finally, associations between self-reported distress reactivity and skin conductance reactivity were tested by re-examining skin conductance reactivity for the math, speech, and anger tasks after including, at Level 3, the individual's self-reported distress reactivity for that task and their baseline distress. Moderating effects of attachment style were tested by adding a cross-product term between the attachment dimension of interest and distress reactivity.

TABLE 4
Effects of gender and attachment style on subjective distress

	Female coefficient	Male coefficient	χ^2 for gender difference	χ^2 for joint significance test
Reactivity to math task	1.26***	.98***	7.14**	135.47***
Moderating effect of anxiety	.09	.14	.09	2.37
Moderating effect of avoidance	–.05	.09	.77	.17
Reactivity to speech task	1.09***	.83***	10.11**	306.15***
Moderating effect of anxiety	.04	.17*	1.17	.45
Moderating effect of avoidance	–.01	.09	.68	1.91
Reactivity to anger task	.91***	.67***	5.50*	161.27***
Moderating effect of anxiety	–.01	.20*	2.27	4.72[t]
Moderating effect of avoidance	.03	.10	.21	1.90
Linear trend across tasks	–.18**	–.15**	7.90**	23.09***
Moderating effect of anxiety	–.05	.03	.96	1.06
Moderating effect of avoidance	.04	.01	.14	.33

[t]$p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$.
Note. The tests for gender differences have 1 degree of freedom, and the joint significant tests have 2 degrees of freedom. All models included baseline distress as a covariate.

FIGURE 2
Adjusted means for self-reported distress reactivity to the math, speech, and anger tasks, stratified by gender.



There were no main effects of self-reported distress reactivity for any of the three tasks, but there was a significant interaction between avoidance and self-reported distress reactivity in predicting skin conductance to the math task, indicating that the association between self-reported and physiological reactivity varied as a function of avoidance, *G* female = –.69, *G* male = –.32, joint $\chi^2 = 12.18$, $p < .003$. To specifically test our prediction of dissociation between self-reported and physiological reactivity among avoidant individuals, we computed the partial correlations between self-reported and physiological reactivity to the math tasks (partialling out age and baseline SCL, as in the multilevel models) among high- and low-avoidance groups (1 *SD* above and below the mean). Among low-avoidant individuals, this partial correlation was statistically significant, $r = .61$, $p = .05$, but this was not the case among high-avoidant individuals, $r = .15$, $p =$ ns.

Discussion

These findings demonstrate that attachment avoidance is associated with a pattern of physiological stress reactivity characteristic of repressive coping, in which tasks that elicit negative thoughts and feelings are accompanied by *heightened* and *escalating* sympathetic nervous system reactivity in the absence of corresponding self-reported distress. This pattern emerged across both attachment-related speech tasks and generalized laboratory stressors, and was particularly pronounced among women. In contrast, individuals' *self-reported* reactivity to the laboratory tasks showed a notably different pattern of progressively *decreasing* distress, and on one task high-avoidant individuals showed significantly greater disassociation between subjective and physiological response than in low-avoidant individuals. The pattern of results for attachment anxiety was notably different: Attachment anxiety was *not* associated with greater sympathetic nervous system reactivity to the laboratory tasks, and in fact anxious women actually showed less of an increase in reactivity across the laboratory assessments. Thus, the pattern of heightened and escalating reactivity appears specific to avoidance, and is not attributable to generalized attachment insecurity.

These findings have important implications for considering the long-term health consequences of attachment insecurity. Based on prior research, one might have expected that anxious individuals would be at most risk for detrimental health outcomes, given that their tendency toward 'maximization' of negative emotions might chronically overactivate autonomic, endocrine, and immunological stress-regulatory systems. Yet the present findings suggest that avoidant individuals may face similar risks, given that their repressive coping style – in response to both attachment-related and nonattachment-related emotional activation – appears to attenuate their subjective reactivity at the expense of successful autonomic regulation. Not only did they show heightened reactivity across all the laboratory tasks, but their reactivity progressively *increased* over the course of the assessment even as their concurrent subjective reactivity declined. Over the life span, one might expect such a pattern to pose significant cumulative health risks (Repetti et al., 2002; Ryff, Singer, Wing, & Love, 2001), and this is clearly an important area for future research.

Notably, we found an unexpected interaction between gender and avoidance, such that the pattern of heightened SCL reactivity among avoidant individuals was more pronounced among women than men. One possible explanation for this finding is that because women showed greater *subjective* reactivity to the laboratory tasks overall, thought suppression and emotional inhibition proved more taxing for avoidant women than avoidant men. Notably, previous research has found that women are more likely than men to ruminate about negative emotions (Kring & Gordon, 1998; Nolen-Hoeksema & Corte, 2004), especially negative emotions generated in interpersonal contexts (Mezulis, Abramson, & Hyde, 2002). This might further complicate avoidant women's efforts at suppressing negative emotions, especially emotions triggered by attachment-related concerns. Given previous research indicating that the negative aspects of interpersonal relationships appear to take a greater health-related 'toll' on women than on men (Kiecolt-Glaser & Newton, 2001), this is clearly an important direction for future study. The gender differences detected in the present study are also notable given that historically, research on adult attachment has found more similarities than differences with respect to gender and attachment style effects. Thus, the present findings suggest that a richer understanding of the interplay between (a) attachment-related strategies for emotion regulation; (b) gender-related patterns of emotional experience and expression within close relationships; and (c) the physiological correlates of both these dimensions can make a unique and substantive contribution to future research on gender and adult attachment.

Developmental considerations

A key question raised by these findings concerns the origin and developmental time course of the patterns detected in the present study. As noted earlier, research has demonstrated that individuals' physiological and interpersonal emotion-regulation capacities and strategies are critically shaped by early family relationships (Repetti et al., 2002), although obviously modifications and situational adjustments take place at later developmental stages. Thus, it is important to consider whether the patterns that we observed represent long-standing tendencies or more recent adaptations to particular situational and/or interpersonal contexts. Consider, for example, the fact that although there was an overall pattern for individuals' self-reported distress to be disassociated from their degree of SCL reactivity to the laboratory stressors, this disassociation was more pronounced (for the first stressor) among avoidant individuals. This is consistent with Mikulincer's (1998) finding that avoidant individuals were unaware of their own physiological indices of anger, and highlights a fascinating developmental question: Is such disassociation a necessary byproduct of avoidant individuals' repressive coping styles, in which negative emotions are inhibited while physiological agitation continues unabated? Alternatively, perhaps avoidant individuals develop repressive coping styles *because* they are fundamentally unaware of the physical manifestations of their own distress, and therefore 'mistake' thought suppression and emotional inhibition for 'actual' coping and emotion regulation beginning at an early age.

One way to explore this possibility is to investigate subjective and physiological stress reactivity in avoidant *children*, and to systematically assess the degree to which they are aware of physiological indices of distress and how this relates to their everyday coping and emotion regulation strategies. It is also important to examine parents' (and later, romantic partners') role in ongoing emotion regulation. Gottman (2001), for example, has emphasized the importance of evaluating parents' *emotion coaching*, and specifically the degree to which parents respond to their children's negative emotions with encouragement to openly share and discuss such feelings (versus urging them to ignore or 'get past' such feelings). It is clearly important to investigate potential associations between such patterns and physiological profiles of repressive coping at different stages of development.

It is also important to determine how malleable such patterns might be.

On this point, it is notable that research on attachment security has increasingly emphasized the importance of assessing not only individuals' generalized (and theoretically long-standing) attachment styles, but also their perceptions of emotional security in *specific*, *current* relationships (Cook, 2000; La Guardia, Ryan, Couchman, & Deci, 2000). The question of whether adult relationships can substantially modify attachment patterns based on childhood experiences is, of course, a critical and hotly debated question (Bar-Haim, Sutton, Fox, & Marvin, 2000; Hamilton, 2000; Kirkpatrick & Hazan, 1994; Waters, Merrick, Treboux, Crowell, & Albersheim, 2000), and it would be particularly informative to determine whether longitudinal changes in attachment experiences are associated with changes in patterns of physiological response, as well (Diamond, 2001). This, of course, would make an important contribution to understanding the specific pathways through which interpersonal relationships shape our mental *and* physical functioning across the life span.

Limitations and future directions

One important limitation of the present research concerns the laboratory context. It is possible that in day-to-day life avoidant individuals successfully steer themselves away from precisely the sorts of emotional experiences that we forced them to confront in the laboratory setting, thereby obviating the need for emotional suppression and potentially protecting themselves from sustained sympathetic nervous system activity. It is also possible that the repressive tendencies of avoidant individuals were unnaturally exaggerated by the fact that they were being closely monitored and observed. Thus, future research should attempt more naturalistic assessments of individuals' subjective and physiological stress reactivity to normally occurring emotional events, in order to provide a better portrait of how they engage with – or adroitly select themselves out of – potentially distressing situations. Ambulatory blood pressure monitoring, combined with diary reports of positive and negative events and interactions, provides an excellent means to conduct such assessments. Closer examination of particularly intense *attachment-specific* stressors (such as sustained arguments or relationship dissolution) would also prove beneficial, since one might expect the greatest disassociation between avoidant individuals' subjective and physiological responses in these circumstances.

It would also be beneficial for future research to focus greater attention on the actual cognitive processes used by avoidant individuals as they encounter such stressors. Although the present study documented notable disassociations between avoidant individuals' subjective and physiological reactivity, we have no way of discerning the specific mechanisms through which these disassociations were 'achieved.' One potential method for elucidating such processes and future research is to combine cognitively oriented techniques, such as the memory tests used by Fraley and colleagues (Fraley, Garner, & Shaver, 2000; Fraley, Waller, & Brennan,

2000) or the subliminal priming techniques used by Mikulincer and colleagues (2000), with simultaneous physiological assessment. The use of *visual* distress stimuli and the subsequent tracking of eye movements might also elucidate avoidant individuals' use of specific cognitive and attentional strategies for distress regulation, and whether these strategies are more or less effective under different conditions. It would also be informative to more closely examine the time scale for such processes. In the present study, the stressors were separated by 1-minute recovery periods, which are long enough to permit some degree of subjective and physiological recovery, but might still allow for some degree of carryover between reactivity to the tasks. Evidence for repressive coping strategies among avoidant individuals would be strengthened by research showing escalating patterns of reactivity despite considerably longer intervening recovery periods.

Another important question left unanswered by the present research concerns how the patterns detected in the present study bear on avoidant individuals' responses to *positive* emotional experiences. Thus far, the majority of research investigating psychobiological correlates of attachment style and other conceptually similar person characteristics has focused on *negative* emotions, and specifically psychological stress (reviewed in Diamond, 2001; Diamond & Hicks, 2004). Given the historical emphasis of attachment research on the critical role of attachment in regulating threat and distress (Bowlby, 1973), this is not altogether surprising. However, greater research on positive emotions – and their adaptive regulation – offers a number of promising lines of inquiry with respect to attachment issues, specifically given the well-documented psychosocial, cognitive, and even physiological benefits associated with positive emotional experience (reviewed in Diamond & Aspinwall, 2003).

Note, for example, that the research by Wegner et al. (1990) demonstrated that the suppression of *positive and exciting* thoughts appeared to be associated with the same heightened SCL reactivity as was demonstrated for negative thoughts. Thus, it is possible that the emotion-regulation strategies of avoidant individuals involved not simply directing attention away from negative emotions, but from *all* strong emotions. This could potentially have a doubly detrimental effect on their physical health, as suppression of positive emotions might entail heightened sympathetic nervous system activity *and* might simultaneously prevent them from experiencing the cognitive and physiological benefits that are associated with sustained experiences of positive emotion (Isen, 1999) and, specifically, positive emotions experienced in the context of intimate relationships (Ryff et al., 2001).

Finally, it is important to note that the individuals in the present study had fairly low levels of anxiety and avoidance overall. Thus, before firmly concluding that only avoidance – and not anxiety – is associated with escalating patterns of SCL reactivity, future research should be conducted with respondents who have higher levels of attachment anxiety. Another methodological consideration is the shared method variance between the self-reports of attachment style and the self-reports of distress ratings (which can magnify associations among these dimensions). Hence, future research would be strengthened by including observer ratings of task-related distress, as in Rholes et al. (1999).

Conclusion

Although prior research might lead one to expect that anxiously attached individuals have the most physiologically detrimental emotion-regulation styles, given their tendency toward heightened and sustained negative affect, the present research indicates that avoidant attachment is also physiologically detrimental. The heightened and escalating patterns of sympathetic nervous system stress reactivity detected in the present study among avoidant adults indicates that these individuals' suppression and dismissal of negative thoughts and feelings does not successfully regulate their autonomic reactivity distress. Furthermore, their disassociation between subjective and physiological stress responses might prevent them from developing the capacity to recognize their own physiological arousal and develop more adaptive coping strategies. Given the extensive prior research on associations between negative affect, autonomic and endocrine stress reactivity, and long-term health, these findings have important implications for understanding the legacy of early attachment relationships on health-related physiological processes over the life span.

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