Published in final edited form as:
Pers Relatsh. 2011 June ; 18(2): 285–301. doi:10.1111/j.1475-6811.2011.01360.x.

Attachment Anxiety, Verbal Immediacy, and Blood Pressure: Results from a Laboratory-Analogue Study Following Marital Separation

Lauren A. Lee, **David A. Sbarra**, **Ashley E. Mason**, and **Rita W. Law**
University of Arizona

Abstract

Marital separation and divorce increase risk for all-cause morbidity and mortality. Using a laboratory analogue paradigm, the present study examined attachment anxiety, language use, and blood pressure (BP) reactivity among 119 (n = 43 men, 76 women) recently separated adults who were asked to mentally reflect on their relationship history and separation experience. We created a language use composite of verbal immediacy from participants' stream-of-consciousness recordings about their separation experience as a behavioral index of attachment-related hyperactivation. Verbal immediacy moderated the association between attachment anxiety and BP at the beginning of a divorce-specific activation task. Participants reporting high attachment anxiety who discussed their separation in a first-person, present-oriented and highly engaged manner evidenced the highest levels of BP at the start of the divorce-specific task. Results provide a deeper understanding of the association between marital dissolution and health and suggest that verbal immediacy may be a useful behavioral index of hyperactivating coping strategies.

Keywords

adult attachment; divorce; verbal immediacy; emotion regulation; blood pressure; cardiovascular reactivity

---

The end of a marriage is associated with a variety of positive and negative outcomes. Although most people are resilient in the face of divorce (e.g. Hetherington & Kelly, 2002), separation experiences are consistently rated among life's most stressful events (Holmes & Rhae, 1967) and are associated with increased risk for a range of negative emotional and physical health outcomes (Ben-Shlomo, Smith, & Shipley, 1993; Kiecolt-Glaser et al., 1987; Lucas, 2005; Tucker, Friedman, Wingard, & Schwartz, 1996). What is not yet known in great detail is why and how some people navigate divorce with minimal or transient distress whereas other people become mired in periods of considerable emotional pain and stuck on trajectories toward poor health outcomes. Attachment theory (Bowlby, 1969, 1973, 1980; Mikulincer & Shaver, 2007) provides a useful vantage point for investigating individual differences in emotional responding following relationship separations. We also believe the theory is useful for developing a more refined mechanistic account of the variables that connect social separations to important health outcomes. The primary goal of this investigation is to operationalize a potential behavioral index of attachment-related hyperactivation (see Mikulincer & Shaver, 2003, 2005; Shaver & Mikulincer, 2002)— the behaviors highly-anxious adults use to cope with real or perceived attachment threats— and

Correspondence should be directed to Lauren A. Lee, University of Arizona, Department of Psychology, 1503 East University Blvd., Rm 313, Tucson, Arizona 85721-0068, lalee@email.arizona.edu, Phone: 520-626-7483; Fax: 520-621-9306.

to determine if this response pattern is associated with increased blood pressure (BP) when adults think about their recent separation experience.

Adult Attachment Anxiety, Divorce, and Emotion Regulation

One of the most robust and well-replicated findings in the literature on social separations is that individual differences in attachment styles, which are presumed to be relatively stable person variables (Fraley, 2002), are highly associated with divorce adjustment (Bakermans-Kranenburg & van Ijzendoorn, 1997; Berman, 1988; Birnbaum, Orr, Mikulincer, & Florian, 1997) and moderate the ways in which people respond to non-marital breakups (Davis, Shaver & Vernon, 2003; Sbarra & Emery, 2005). Attachment styles reflect how people view themselves and others in close relationships and play a critical role in regulating the experience of felt security (Mikulincer & Shaver, 2007; Sroufe & Waters, 1977). In the face of real or perceived threats to felt security, when the primary strategy of attachment figure proximity seeking is not a viable option, people high in anxiety and avoidance engage in different secondary strategies to regulate distress. Attachment anxiety is associated with *hyperactivating* strategies, which are defined by repetitive efforts to feel close to, or reunite with, the attachment figure that render the system chronically activated. In contrast, highly-avoidant individuals tend to engage in *deactivating* strategies by dropping all attempts to restore security and down-regulating the attachment system to minimize their distress (for a detailed account, see Mikulincer & Shaver, 2007).

Hyperactivating strategies, in particular, have clear, health-relevant biological correlates (Diamond, 2001), and, for this reason, are the focus of the current investigation. For example, Roisman, Tsai and Chiang (2004) hypothesized that specific profiles of sympathetic nervous system responding would map onto these individual difference dimensions during the Adult Attachment Interview (AAI) and found that hyperactivating strategies were associated with increased heart rate reactivity (Roisman, 2007; Roisman et al., 2004). During a conflict discussion with a romantic partner, anxiously-attached adults evidenced an increase in both DBP and rate-pressure product (a composite measure of pulse rate and systolic blood pressure [SBP]; Kim, 2006). These findings are consistent with the theory that high attachment anxiety can produce heightened physiological responding in stressful situations (Feeney & Kirkpatrick, 1996).

What behaviors define these hyperactivating coping strategies? A specific and testable hypothesis derived from attachment theory is that heightened physiological responses (upon an attachment threat) will be observed among people higher in attachment anxiety *when they engage in hyperactivating coping strategies*. As described below, we believe that studying the specific words that people use to describe their experiences can provide a rich behavioral index of variability in attachment-related hyperactivation. In turn, these behaviors may illuminate the psychosocial context in which anxiety is related to health-relevant biological responses following marital separation.

Language Use and Emotion Regulation

The last decade has witnessed a surge of research investigating the role of natural language use as a behavioral indicator of emotion regulatory strategies (Tauscizk & Pennebaker, 2010). Language plays a powerful role in communicating psychological states (Pennebaker & Graybeal, 2001) and directing attention to different aspects of the environment (Stapel & Semin, 2007). The study of language use reveals new information about how individuals organize and experience life events, especially in the context of social relationships (Chung & Pennebaker, 2007; Graham et al., 2009; Pressman & Cohen, 2007; Rohrbaugh, Mehl, Shoham, Reilly & Ewy, 2008; Slatcher, Vazire & Pennebaker, 2008). In addition, the words people use to describe their experiences can reflect individual differences in response to

stressful life events (Cohn, Mehl, & Pennebaker, 2004; Pennebaker, Mayne, & Francis, 1997). Specifically, psychological distancing, a composite category that reflects less personal and more detached language, has emerged as one such variable (Cohn et al., 2004). Psychological distancing is implicated in adaptive self-reflection and directed thinking about a negative event from a third-person perspective, which are associated with less emotional and physiological reactivity in the short-term and mitigates rumination in the long-term (Ayduk & Kross, 2010; Kross, 2009). A recent language use study demonstrated that people used psychological distancing to cope with the terrorist attacks of September 11, 2001. Cohn, Mehl, and Pennebaker (2004) interpreted these data as suggesting that the 9/11 attacks may have catapulted people in to a state of shock that necessitated cognitive detachment from the event in order to continue with daily life. Decreases in psychological distancing language were observed as time passed following the attacks (Cohn et al., 2004).

The inverse of psychological distance is verbal immediacy (Biber, 1988). The immediacy/distance construct is a factor-analytically derived composite consisting of the standardized language categories of first-person singular pronouns ('I', 'me', 'my'), discrepancy words (e.g., 'should', 'would'), present tense verbs and inverse scores for articles ('a', 'the') and words of more than six letters that was validated on an adult sample (Mehrabian, 1967; Pennebaker & King, 1999). Immediate language is associated with a focus on the here and now, reflected by greater use of concrete, personal, involved and experiential language. Immediate language also is positively correlated with neuroticism and negatively correlated with openness, suggesting that the language construct is associated with other valid individual differences (Pennebaker & King, 1999). Borelli, Sbarra, Mehl, and David (2010) recently used transcripts from child attachment interviews and found that attachment group membership is associated with the degree of *experiential connectedness* (assessed by verbal immediacy) that children express when describing difficult relationship experiences. Highly-anxious children used more immediate language in their attachment interviews relative to secure and avoidant children. The authors suggested that different levels of experiential connectedness are associated with specific child attachment styles. This behavioral finding provides important evidence for construct validity of the hyperactivating emotion-regulation strategy used by anxiously-attached children. Furthermore, this finding suggests that at least one dimension of the hyperactivation construct may be over-involvement with one's own thoughts and feelings and that this process may be indexed behaviorally through verbally immediate language.

The Current Study

Attachment anxiety is associated with hyperactivating emotion-regulation strategies and has clear implications for how individuals cope with relationship disruptions. Little is known, however, about the specific behaviors that index hyperactivation. Using a behavioral index of hyperactivation may help illuminate the extent to which anxiety is associated with physiological responding following the end of marriage. In the case of divorce, we hypothesize that the magnitude of the anxiety trait effect on BP responses will depend on the degree to which adults evidence a high degree of the hyperactivation state, which we operationalize using verbal immediacy. In particular, we expect that the greatest increases in BP responses during a divorce-specific mental activation task (DMAT) will be observed among highly-anxious adults who talk about their separation experience in an immediate, present-oriented, and experiential way during a stream-of-consciousness (SOC) task about their separation. The term hyperactivation suggests an affective amplification process (see Sbarra & Ferrer, 2006), and we therefore expect a three-way interaction whereby people who report greater attachment anxiety and use more immediate language will evidence the greatest increases in BP when asked to think about their relationship history and separation experience.

Method

Participants

Participants were 119 community-dwelling adults (*n* = 43 men, 76 women) recruited through newspaper advertisements, divorce recovery groups and the local family and conciliation court. On average, participants were 41.5 years old (*SD* = 9.75 years; range = 19 – 63 years old), reported having been married for 14.33 years before the separation (*SD* = 8.5 years; range = .42 – 42.5 years), and having physically separated from their former partner an average of 3 months and 3 weeks before the study session (*SD* = 2 months; range = 2 – 46 weeks). Twenty-two percent of the sample were legally divorced, 38% were legally separated, and 40% were physically separated without any legal action (the remainder of the sample did not describe their separation status). Seventy-nine percent of sample described themselves as White (non-Hispanic), 13% as Hispanic, 2% African American, 1% Native American, 1% Asian American, and 4% Other (the remainder of the sample chose not to provide ethnicity data). Participants reported spending an average of 27% of each day (in the two weeks before study intake) thinking about their ex-partner and the demise of their marriage (*SD* = 26%; range = 0 – 95%). Data for this study were collected over a period of 40 months between 2006 and 2010, and all aspects of this study were approved by the University of Arizona Human Subjects Protection Program.

Procedures

Adults who responded to the study advertisements were screened along several dimensions: All participants who reported that they were generally healthy, without a history of a psychotic disorder, and, for women, those not pregnant, were deemed eligible to participate. Participants were told that the purpose of the study was to understand "how adults adjust to marital separation and the ways in which your body responds when you think about and reflect on your separation experience." Participants were asked to refrain from using tobacco and caffeine for at least four hours before the study visit. At the laboratory visit and prior to the physiological measurement section of the study, participants completed demographic, health, and relationship dissolution questionnaires in addition to an SOC speech task in which they spoke about their separation experience. For the SOC task, participants were seated alone in a room with a digital voice recorder device and instructed to "describe any thoughts and feelings" about the relationship or their former partner. Participants were asked to speak continuously across a 4-minute period. Participants' SOC narratives were transcribed and analyzed to derive verbal immediacy scores (see below).

Following the SOC, a research assistant attached a BP device to a participant's wrist. Participants were then asked to sit quietly and to mentally reflect (silently) on a series of mundane scenarios presented on a computer monitor. This mundane events recall (MER) task served as a baseline period, and mundane scenarios included thinking about preparing a dinner, doing laundry, going to the grocery store, and mailing a letter. The MER task was intended to capture physiological demands associated with non-emotional mental reflection, and this period constituted the baseline assessment.

Following the MER, participants completed the 7-minute divorce-specific mental activation task (DMAT). Participants were instructed to "spend some time thinking about yourself and your partner in a variety of different situations." A series of seven questions was then presented on a computer screen and participants were asked to "concentrate on the question by letting any relevant thoughts, feelings, or images come to mind" for a one minute period; after one minute, the next question was presented. The DMAT items are reported in detail elsewhere (Sbarra, Law, Lee & Mason, 2009), but, in general, this task asked participants to reflect on their relationship history, the first time they thought about or learned about the

separation, and difficult moments during the separation. In the DMAT, participants did not respond to the questions aloud, but mentally reflected on their answers to the questions during each 1-minute period. In general, participants reported a high degree of engagement during the DMAT and found the task to be representative (although not identical) to how they think about the separation experience outside of the laboratory (see Sbarra et al., 2009).

Following the DMAT and task engagement appraisal items, participants were asked to sit quietly for four minutes as we continued to measure their BP: This period constituted the DMAT recovery (DMATR) period. After the DMATR, a research assistant removed the BP equipment from the participants. Participants were then debriefed about the overall nature of the study and paid $100 for the laboratory visit.

Psychological Measures

Experiences in Close Relationships – Revised (ECR-R)—The ECR-R (Fraley, Waller & Brennan, 2000) is a reliable, widely used 36-item questionnaire that measuring attachment-related anxiety in close relationships (see also Butzer & Campbell, 2008; Campa, Hazan & Wolfe, 2009; Domingue & Mollen, 2009; Fraley, Niedenthal, Marks, Brumbaugh & Vicary, 2006). The anxiety scale captures thoughts and feelings related to approval and responsiveness from partners, as well as worry about romantic relationships (e.g., “I get frustrated if romantic partners are not available when I need them,” and, “I worry that romantic partners won’t care about me as much as I care about them”). Reliability in our sample for the anxiety scale of the measure was high (α = .93).

Linguistic Inquiry and Word Count program (LIWC)—The LIWC system (Pennebaker & Francis, 1999) is a computer-based text analysis program that counts words in a given text file and reports the percentages of word use across 74 psychological and grammatical categories. All SOC recordings were transcribed and formatted for LIWC analysis by a research assistant, then independently checked for accuracy by another research assistant. The LIWC program matches target words in a given speech sample to words in its dictionary; the resulting variables reflect the percentage of total words in the speech sample. The present analysis focused on the verbal immediacy composite score, which includes standardized language categories of first-person singular pronouns (“I”, “me”, “my”), discrepancy words (e.g., "should", "would"), present-tense verbs and inverse scores for articles (“a”, “the”) and words comprised of more than six letters (see Cohn et al., 2004; Pennebaker & King, 1999). Higher immediacy scores reflect a focus on the here and now by using more concrete, personal, involved and experiential language, whereas lower immediacy scores are characterized by having a more detached and impersonal tone. The reliability of the items comprising this scale was acceptable (α = .71).

BP Assessment

BP was assessed using a non-invasive (relative to a standard oscillometric cuff) tonometry device over the radial artery to provide frequent, real-time updates of SBP and DBP (Vasotrac AMP205; Medwave Inc., Arden Hills, Minnesota). SBP is the peak pressure in the arteries at the beginning of the cardiac cycle, whereas DBP is the lowest pressure at the resting phase of the cycle. The Vasotrac uses frequent compression and decompression of the radial artery at the wrist to detect the zero-load state around which the pressure signals are measured. This information is used to detect and then display arterial pressure and wave form every 12 to 15 beats. The Vasotrac was calibrated against radial catheter measures of BP and demonstrated excellent convergent validity (mean R^2 for SBP and DBP = .95; Belani et al., 1999). The tonometry device was placed over the radial artery on the participants’ non-dominant arm, and participants placed their arm on a table in front of them for the duration of the study. BP data were scored using Mindware Technology’s

(Westerville, Ohio) BP 2.6 post processing software module. Minute-by-minute means were computed for SBP and DBP across the DMAT and DMATR. In the DMAT, each minute of BP data includes the amount of time the participant spent reading each question as well as the time spent reflecting on each answer. In this sample, 87% (n = 104) of the participants had complete BP data across the 7-minute DMAT.

Covariates

To account for possible differences in demographic and health status variables on BP at study entry several covariates were included in these analyses: participants' age, gross annual income, body mass index (BMI; as calculated by weight in kg/height in meters), and self-reported information on participants' (a) history of physician-diagnosed high BP (yes/no), and (2) current tobacco use (yes/no). In addition, two relationship specific variables were included in the analyses: the length of the relationship before physical separation (described above in the participants section), and the amount of time since the separation at entry into study (rounded to the nearest half-month).

Data Analysis

The main study hypothesis was examined using multilevel modeling in SAS PROC MIXED (Singer, 1998). This approach takes into account the non-independent (observations are nested under individual participants) nature of SBP and DBP across the seven minutes of the DMAT and four minutes of the DMATR and allows us to examine BP changes over time during the task. We used a model building strategy (Singer & Willett, 2003) across the analyses and began by examining an empty (unconditional means) model that contained only the covariates of interest. Next, we sought to characterize the functional form of SBP and DBP across the seven minutes of the DMAT and four minutes of the DMATR (analyzing each task separately) by testing linear and quadratic models to represent changes over time. Once we characterized the temporal changes in BP, we added attachment anxiety and verbal immediacy as main effects in the model, in addition to their two-way interactions with Time. The final model, which includes an explicit test of the main study hypothesis, examines the three-way interaction of time attachment anxiety X verbal immediacy.

Results

Figure 1 illustrates the patterns of SBP and DBP across all 15 minutes of the study. Table 1 displays the bivariate correlations (and descriptive statistics) for the predictors and covariates of interest. The association between attachment anxiety and verbal immediacy was positive and statistically significant (p<.01), indicating that participants reporting more anxious-attachment also spoke about their separation experience in a present-oriented and experiential manner during the SOC recording session.

To examine the possibility that attachment anxiety and verbal immediacy were associated with higher BP at entry into the study, we examined a single multilevel model that included the covariates of interest, the main effects of attachment anxiety and verbal immediacy, as well as their interaction term on average BP responses during the MER. There were no significant main effect differences on BP for attachment anxiety, verbal immediacy, or the interaction term.

Changes in BP Across the DMAT as a Function of Anxiety and Immediacy

The first series of multilevel models examined our main hypothesis that the interaction of attachment anxiety and verbal immediacy would alter the course of BP across each minute of the DMAT after accounting for the covariates of interest. After establishing a baseline model (Table 2, Model 1), we tested a series of alternative models to determine if

participants demonstrated significant change over the DMAT period. None of the three specifications for Time described above improved model fit over-and-above the baseline model. On average, then, participants did not exhibit significant (i.e., systematic) increases or decreases in BP across the DMAT.

The next series of models examined both attachment anxiety and verbal immediacy as main effects on BP (Table 2, Model 2). Attachment anxiety had significant main effects on both the SBP (*B*=2.43, *SE*=.92, *p*=.01) and DBP (*B*=2.20, *SE*=.70, *p*=.002), whereas the verbal immediacy main effects were not significant. After accounting for immediacy, participants reporting a high degree of attachment anxiety evidenced higher SBP and DBP at the beginning of the DMAT.

Model 3 (Table 2) examined the two-way interactions of (a) Time X Attachment Anxiety and (b) Time X Verbal Immediacy to investigate the potential moderating effects of anxiety or immediacy on SBP and DBP changes across the DMAT. As shown in the table, neither of these interactions was significant. A final time-based model (Table 2, Model 4) examined the three-way interaction of Time X Attachment Anxiety X Verbal Immediacy. As shown in the table, the three-way interaction of attachment anxiety and verbal immediacy across each minute of the DMAT was not significant. Thus, we did not find support for the main hypothesis of the study.

Given that the two-way Anxiety X Immediacy effect was observed for SBP and DBP in Model 4, we conducted a series of exploratory analyses to formally examine the possibility that these variables might interact to predict BP at the start of the DMAT (rather than altering the course of BP responses across the DMAT). As shown in Model 5, after accounting for both main effects and all other covariates, the Attachment Anxiety X Verbal Immediacy interaction was significant for both SBP (*B*=3.38, *SE*=1.26, *p*=.01) and DBP (*B*=2.36, *SE*=.96, *p*=.01). Using a recently-developed computational tool to decompose simple slopes in multilevel models (Preacher, Curran & Bauer, 2006), we found that the effects of anxiety on BP responses differed as a function of verbal immediacy (SBP: *z*=4.43, *p*<.001; DBP: *z*=4.51, *p*<.001). The interaction, displayed in Figure 2, operates at the BP intercept during the DMAT and indicates those participants who spoke in a more experientially engaged manner during the SOC (greater verbal immediacy) evidenced significantly higher BP at the beginning of the DMAT task *only if* they also reported high trait attachment anxiety. Finally, we re-centered the Time parameter and treated the final minute of the DMAT as the intercept. We found that the Anxiety X Immediacy interaction persisted across the entire 7-minute DMAT, *B*= 3.65, *SE*=1.28, *p* = .005, for SBP and for DBP, *B*= 2.42, *SE*=.97, *p* = .01. Thus, adults higher in attachment anxiety and verbal immediacy ended the DMAT task with significantly higher SBP and DBP

The analysis described above indicates that elevations in BP among highly-anxious people who speak about their separation in an immediate way become apparent when these people are asked to reflect on their separation in the DMAT. In the health psychology literature, it also is common to address individual differences in reactivity. Therefore, to ascertain if people high in anxiety and immediacy show a larger increase in BP from the MER to the DMAT, we entered mean MER scores for SBP and DBP into the respective final models. Once we accounted for mean MER scores, the previously significant two-way interaction (in Model 5) was non-significant. We explored whether the lack of reactivity effects was due to statistical (rather than substantive) issues by altering the proposed models to account for shared variance among covariates and focal predictors that may suppress the Anxiety X Immediacy effects. The first model included the significant covariates from the original analysis (i.e., age and history of high BP) and mean MER BP scores, along with anxiety, immediacy, and their interaction. Consistent with the results from Model 5, the attachment

anxiety and verbal immediacy interaction was significant for both SBP (*B*=2.55, *SE*=.74, *p*=.001) and DBP (*B*=1.43, *SE*=.53, *p*=.01), and an identical pattern of significant/non-significant effects emerged as described for the simple slopes displayed in Figure 2. We then tested a more complete model by including all covariates reported in Model 5 (with the exception of BMI), mean MER BP scores, and the predictors of interest. Body Mass Index was removed from the analysis due to its significant correlation with both attachment anxiety (r = .24, p <.001) and verbal immediacy (r = .19, p <.05). 1 Consistent with the less restrictive model, the Attachment Anxiety X Verbal Immediacy interaction was significant for both SBP (*B*=2.12, *SE*=.71, *p*=.003) and DBP (*B*=1.29, *SE*=.52, *p*=.02), and a simple slopes analysis revealed that the Anxiety X Immediacy interaction effect was significant only for adults who evidence high levels of verbal immediacy during the SOC (SBP: z=4.74, p<.0001; DBP: z=4.96, p<.0001).

Does the Attachment X Immediacy Interaction on BP Persist in Time?

To investigate whether the Anxiety X Immediacy interaction effect (on initial BP at the beginning of the DMAT) observed in Model 5 would persist after the DMAT, we tested a final series of models that included the 4-minute recovery period following the DMAT (i.e. DMATR).2 As shown in Table 3, the Attachment Anxiety X Immediacy interaction effect was significant for both SBP (*B*=3.13, *SE*=1.27, *p*=.02) and DBP (*B*=2.70, *SE*=.98, *p*=.01), indicating that BP was higher at the beginning of the DMATR depending on level of trait attachment anxiety and experiential engagement during the SOC. This effect did not persist across the entire recovery period. By the end of the DMATR, the attachment anxiety and verbal immediacy interaction effect was not significant, but the attachment anxiety main effect remained significant (SBP: *B*=2.94, *SE*=.94, *p*=.05; DBP: *B*=1.60, *SE*=.70, *p*=.02).

Discussion

The present study examined BP responses among recently separated/divorced adults during a laboratory task that asked them to think about their relationship history and recent separation experience. Although anxiety and verbal immediacy (our behavioral index of attachment-related hyperactivation) were positively correlated, we did not find support for the hypothesized anxiety X immediacy interaction when predicting BP *changes across* the divorce-specific laboratory task (the DMAT). We did, however, find that adults who reported greater attachment anxiety evidenced significantly higher BP at the onset of DMAT when they also spoke in a more personal, present-oriented, and engaged manner about their divorce experience earlier in the laboratory paradigm. The reactivity analyses indicated that people high in anxiety and immediacy also evidenced significantly greater increases from the MER to the DMAT once we removed the non-significant effect of BMI from the model. Finally, within the recovery task (the DMATR), we observed the same interaction effect at

[1]Miller and Chapman (2001) assert that standard statistical control by inclusion of covariates is implemented in order to reduce variance associated with the outcome of interest and that removal of shared variance between covariates and predictors of interest artificially alters the relationship between the focal predictors and the outcome. In the case of our analyses, BMI is unassociated with either MER or DMAT BP scores, but significantly associated with both anxiety and immediacy. Therefore, controlling for BMI scores in a model examining change (whereby more than 65% of the variance in the outcome in both SBP an DBP during the DMAT is already accounted for by MER BP scores), alters the nature the attachment and immediacy variables, which eliminates the interaction effect on BP reactivity. Given that (a) BMI is not associated with individual differences in BP at rest during the MER or with changes from the MER to the DMAT, and, (2) accounting for BMI alters the nature of attachment anxiety and immediacy measures, we believe that there is a reasonable rationale for excluding this variable from the reactivity analyses. When BMI is removed from the analyses reported as part of Model 5, the same pattern of significant effects is observed.

[2]Prior to testing the attachment anxiety X verbal immediacy interaction on the starting point of the DMATR, we examined the possibility that individuals high in attachment anxiety and verbal immediacy may evidence BP changes across DMATR. Neither the linear or quadratic interaction effects were significant and we chose to focus our analysis on the attachment anxiety Xverbal immediacy interaction.

the beginning of the task but only a significant main effect for attachment-anxiety at the end of the recovery period.

A clear strength of this study is its multi-method framework: The significant two-way interaction consists of self-reported and behaviorally sampled language use data operating together to predict a health-relevant physiological outcome. This type of methodological convergence across multiple domains of assessing emotional experience is relatively rare in psychological science (cf. Mauss & Robinson, 2009) and offers potentially new ways of thinking about the nature of attachment-related hyperactivation and the construct of immediacy.

The findings provide a conceptual replication of prior work documenting a significant positive association between anxiety and heightened cardiovascular responding (Feeney & Kirkpartick, 1996; Kim, 2006; Roisman, 2007; Roisman et al., 2004). In the non-emotion, non-divorce baseline task (the MER), participants high in anxiety, immediacy, or *on both* anxiety and immediacy did not evidence significantly elevated BP (despite having already spoken about their separation during the SOC task), yet at the start of the DMAT, we observed the significant two-way interaction effect after accounting for a wide-range of health-relevant and relationship-specific variables. One way of interpreting this finding is in terms of the differential task demands; it is not until we asked participants to think about their relationship history and separation experience that we observed differences in BP. In this respect, we view the DMAT as revealing the BP correlates of attachment-related processes. This perspective is consistent with Coan and colleagues (Coan, Allen & McKnight, 2006) capability model of physiological responding, which posits that responses to emotionally salient stimuli are the result of the interaction between an individual trait and the evoked emotional state. The capability theory holds that physiological responses associated with trait-level propensities are best evoked using state manipulations designed to assess the emotional system in question. In the present analysis, we see the BP correlates of high anxiety/high immediacy more completely when participants are asked to think about their recent separation experience. We presume, and future research can test, that the DMAT is especially difficult for high anxiety people who also engage in hyperactivating coping strategies.

The capability model does not require that the DMAT itself reveals the trait effect, and it is plausible that merely thinking about the task was enough to prime these responses for the high anxiety/high immediacy people. The idea that an anticipation effect is operating in the current study is consistent with other research in health psychology demonstrating that preparing to do a stressful laboratory task can elicit a stronger cardiovascular response than the task itself (Feldman, Cohen, Herrick & Lepore, 2004; Gendolla, 1996; Wright, 1996; Wright, Martin & Bland, 2003).

To the extent that the immediacy construct can be used as a behavioral index of attachment-related hyperactivation, elevated BP at the start of the DMAT was observed only for those people who have a trait-like tendency toward hyperactivation as a means of coping with attachment threat (i.e., high anxiety participants) and who exhibit state-specific indicators of a high degree of experiential engagement. This finding highlights the need to take care in equating anxiety with hyperactivation; not all anxious individuals become highly engaged (or, over-involved) in their experiences, and, in this study, for the DMAT period, it was the synergy of the trait and state that revealed the highest elevations in BP (see Coan et al., 2006).

When relationships dissolve, highly anxious adults engage in much more rumination and brooding about the loss event, as well as prolonged thoughts about reunion with an ex-

partner and behavioral attempts to rekindle the relationship (Davis et al., 2003; Saffrey & Ehrenberg, 2007; Sbarra, 2006), and these affective amplification tendencies are the behavioral hallmarks of attachment hyperactivation (Mikulincer & Shaver, 2007). The current findings suggest that more immediate speech, which reflects a greater focus on the present and uses a more personal and involved tone, also is a useful index for cataloging ways in behavioral hyperactivation is associated with exaggerated physiological responding during *potential* instances of attachment threats. (We consider the DMAT a potential attachment threat because we expected that it would not evoke a need for emotion regulatory effort among low anxiety/low immediacy participants, but that it would be an emotion regulatory challenge for high anxiety/high immediacy participants.) The low anxiety/high immediacy group, without the trait propensity to engage in hyperactivating strategies, did not exhibit this association even when using highly immediate language.

A primary question of interest is the extent to which the current findings are health-relevant. It is clear that marital separation and divorce increase risk for health-related morbidity and mortality (Ben-Shlomo et al., 1993; Sbarra & Nietert, 2009), and that attachment anxiety is associated with worse psychological outcomes following these events (Bakermans-Kranenburg & van Ijzendoorn, 1997; Berman, 1988; Birnbaum, et al., 1997) and with poor physical health outcomes in variety of other contexts (Kotler, Buzwell, Romeo & Bowland, 1994; Picardi et al., 2005; Rossi et al., 2005). Within the current study, the high anxiety/high immediacy participants evidenced SBP measurements that would be considered Stage I hypertension throughout both the activation and recovery periods, and it is notable that these effects were observed after statistically accounting for a variety of covariates or competing predictors. Within Model 5 (Table 2), we see that participants who score one standard deviation above the mean on both anxiety and immediacy begin the DMAT with an almost 5 mmHg increase in SBP and, from Table 3, we see that these same participants evidence an almost 6 mmHg increase in SBP at the start of the DMATR. Slow/incomplete recovery of cardiovascular responses following stress is associated with negative physical and mental health outcomes (Waugh, Fredrickson & Taylor, 2008; Waugh, Panage, Mendes & Gotlib, 2010), and the BP metric calibrated in a manner that has clear health relevance (e.g., an SBP of 130 mmHg is clearly better than an SBP of 140 mmHg, see Whelton, Chin, Xin & He, 2002).

It is important to distinguish between the DMAT and DMATR periods; in the latter, the main effect of anxiety was stronger (and it persisted until the end of the study period) than the anxiety X immediacy interaction. One explanation for this difference across the periods of study may be that the synergistic effect of both variables initially activates a BP response, but that the main effect of anxiety is enough to sustain elevations across time once observed. Future research is needed to clarify exactly when anxiety effects *depend* on the extent of concomitant hyperactivation and when the main effect of the attachment trait is sufficient to evoke a physiological response.

Finally, although the emphasis of this paper is on the health implications of attachment anxiety (via BP responding), this work also is first to demonstrate, with adults, a significant positive correlation between anxiety and verbal immediacy, which we have argued can be used as a behavioral index of attachment-related hyperactivation. One element of verbal immediacy that may be most relevant to hyperactivation is self-focused attention via first-person singular words. Although it may be intuitive to think about hyperactivating strategies as other-focused (e.g., bids for reunion, proximity and reassurance seeking), ruminative processes are decidedly self-focused and have clear negative consequences. For example, in the non-marriage literature, use of ‘I’ statements in expressive writing tasks typifies post-breakup writings and is correlated to grief and intrusion measures post-breakup (Boals & Kline, 2005). ‘I’ language is also greater in depressed individuals (Bucci & Freedman, 1981)

and is associated with poorer adjustment when first writing about a traumatic event, but linked to better psychological adjustment following a full expressive writing intervention, which may reflect self-efficacy (Dunnack & Park, 2009). In the present data, there is no evidence that 'I' words alone interact with anxiety to yield the same BP results (as observed when using the immediacy composite), so an essential question for future research is what aspects of immediacy— self-focused rumination, present-oriented discourse, short and engaged speech— best reflect the hyperactivation construct. It is important to note that verbal immediacy is distinct from negative emotion and affect. Although Buchheim and Mergenthaler (2000) found that highly anxious anxious individuals used greater negative emotion words, negative emotion words and immediacy are uncorrelated our sample and including negative emotion words in the present analyses did not alter the pattern of the results.

The findings reported here should be considered in light of several limitations. First, because the DMAT is a mental-activation task, there is no way to be certain individuals spent the full time during this period thinking about their relationship. This study replicates previous research demonstrating that the DMAT can produce cardiovascular changes (Sbarra et al., 2009) but cannot reveal the specific thoughts associated with this reactivity. Despite this limitation, most participants reported that they were highly engaged in the task and that the images provoked during the DMAT were vivid and similar to how they think about their separation outside of the lab. Second, we do not have a non-divorced comparison group in this study and we are therefore unable to definitively conclude that the effects we found are the results of thinking about relationship separation specifically. We did observe BP increases from the MER to the DMAT, and also demonstrated these reactivity effects in models controlling for health-relevant covariates; thus, the MER task serves as a critical within-person control demonstrating that highly-anxious adults do not show elevated BP at entry into the study but, specifically, when they begin to think about their separation experience. Third, relative to the entire sample, there were few men, which creates an unbalanced design and raises concern that the observed effects may be driven by this oversampling of women in the study. To the extent that women are more versed at discussing emotionally difficult events (e.g., Newman, Groom, Handelman, & Pennebaker, 2008), the findings may not generalize to all adults experiencing a marital separation. Future replications should include more men.

Conclusion

This study represents one of the first attempts to investigate language use as a behavioral index of attachment-related emotion regulation. After accounting for a range of health-related demographic and relationship-specific covariates, participants who reported a high degree of attachment anxiety and who spoke about their former relationship/partner in a more personal, present-oriented, and engaged manner evidenced significantly elevated SBP and DBP at the beginning and end of the DMAT. Acting in combination, high attachment anxiety and high immediacy were associated with a pattern of BP responses that, if maintained over time, have clear negative health outcomes. This works points to a potential route through which specific individual differences can increase risk for prolonged biological dysregulation in the face of divorce.

Acknowledgments

This research was supported by grants from the National Institute of Aging (AG#028454). the National Institute of Mental Health (MH#074637), and the National Science Foundation (BCS #0919525) to the second author, and a F31 National Research Service Award (#HD059396) to the first author.

The authors are grateful to Lindsey Bupp for her day-to-day management of the marital transitions study and to David Lozano for technical assistance with the blood pressure calibration and data collection.

References

Ayduk Ö, Kross E. Analyzing negative experiences without ruminating: The role of self-distancing in enabling adaptive self-reflection. Social and Personality Psychology Compass. 2010; 4(10):841–854. doi:10.1111/j.1751-9004.2010.00301.x.

Bakermans-Kranenburg M, van Ijzendoorn MH. Adult attachment and the break-up of romantic relationships. Journal of Divorce & Remarriage. 1997; 27(3–4):121–139. doi:10.1300/J087v27n03.

Belani K, Ozaki M, Hynson J, Hartmann T, Reyford H, Martino JM, Poliac M, Miller R. A new noninvasive method to measure blood pressure. Anesthesiology. 1999; 91:686–692. [PubMed: 10485780]

Ben-Shlomo Y, Smith GD, Shipley M. Magnitude and causes of mortality differences between married and unmarried men. Journal of Epidemiology and Community Health. 1993; 47:200–205. [PubMed: 8350032]

Berman WH. The relationship of ex-spouse attachment to adjustment following divorce. Journal of Family Psychology. 1988; 1(3):312–328. doi:10.1037/h0080455.

Biber, D. Variation across speech and writing. Cambridge, England: Cambridge University Press; 1988.

Birnbaum GE, Orr I, Mikulincer M, Florian V. When marriage breaks up: Does attachment style contribute to coping and mental health? Journal of Social and Personal Relationships. 1997; 14(5): 643–654. doi:10.1177/0265407597145004.

Boals A, Klein K. Word use in emotional narratives about failed romantic relationships and subsequent mental health. Journal of Language and Social Psychology. 2005; 24(3):252–268. doi: 10.1177/0261927×05278386.

Borelli JL, Sbarra DA, Mehl M, David DH. Experiential connectedness in children's attachment interviews: An examination of natural word use. Personal Relationships. 2010 no. doi: 10.1111/j. 1475-6811.2010.01294.x.

Bowlby, J. Attachment and loss: Vol 1: Attachment. 2nd ed.. New York, NY: Basic Books; 1969.

Bowlby, J. Attachment and loss: Vol 2: Separation. New York, NY: Basic Books; 1973.

Bowlby, J. Attachment and loss: Vol 3. Loss: Sadness and depression. New York, NY: Basic Books; 1980.

Bucci W, Freedman N. The language of depression. Bulletin of the Menninger Clinic. 1981; 45(4): 334–358. [PubMed: 6176285]

Buchheim A, Mergenthaler E. The relationship among attachment representation, emotion-abstraction patterns, and narrative style: A computer-based text analysis of the adult attachment interview. Psychotherapy Research. 2000; 10(4):390–407. doi:10.1093/ptr/10.4.390.

Butzer B, Campbell L. Adult attachment, sexual satisfaction, and relationship satisfaction: A study of married couples. Personal Relationships. 2008; 15(1):141–154. doi:10.1111/j. 1475-6811.2007.00189.x.

Campa MI, Hazan C, Wolfe JE. The form and function of attachment behavior in the daily lives of young adults. Social Development. 2009; 18(2):288–304. doi:10.1111/j.1467-9507.2008.00466.x.

Chung, C.; Pennebaker, J. The psychological functions of function words. In: Fiedler, K., editor. Social communication. New York, NY: Psychology Press; 2007. p. 343-359.

Coan JA, Allen JJB, McKnight PE. A capability model of individual differences in frontal EEG asymmetry. Biological Psychology. 2006; 72(2):198–207. doi:10.1016/j.biopsycho.2005.10.003. [PubMed: 16316717]

Cohn MA, Mehl MR, Pennebaker JW. Linguistic markers of psychological change surrounding September 11, 2001. Psychological Science. 2004; 15(10):687–693. doi:10.1111/j. 0956-7976.2004.00741.x. [PubMed: 15447640]

Davis D, Shaver PR, Vernon ML. Physical, emotional, and behavioral reactions to breaking up: The roles of gender, age, emotional involvement, and attachment style. Personality and Social

Psychology Bulletin. 2003; 29(7):871–884. doi:10.1177/0146167203029007006. [PubMed: 15018675]

Diamond LM. Contributions of psychophysiology to research on adult attachment: Review and recommendations. Personality and Social Psychology Review. 2001; 5(4):276–295. doi:10.1207/S15327957PSPR0504.

Domingue R, Mollen D. Attachment and conflict communication in adult romantic relationships. Journal of Social and Personal Relationships. 2009; 26(5):678–696. doi:10.1177/0265407509347932.

Dunnack ES, Park CL. The effect of an expressive writing intervention on pronouns: The surprising case of I. Journal of Loss and Trauma. 2009; 14(6):436–446. doi:10.1080/15325020902925084.

Feeney BC, Kirkpatrick LA. Effects of adult attachment and presence of romantic partners on physiological responses to stress. Journal of Personality and Social Psychology. 1996; 70(2):255–270. doi:10.1037/0022-3514.70.2.255. [PubMed: 8636881]

Feldman PJ, Cohen S, Hamrick N, Lepore SJ. Psychological stress, appraisal, emotion and cardiovascular response in a public speaking task. Psychology & Health. 2004; 19(3):353–368. doi:10.1080/0887044042000193497.

Fraley RC. Attachment stability from infancy to adulthood: Meta-analysis and dynamic modeling of developmental mechanisms. Personality and Social Psychology Review. 2002; 6(2):123–151. doi:10.1207/S15327957PSPR0602.

Fraley RC, Niedenthal PM, Marks M, Brumbaugh C, Vicary A. Adult attachment and the perception of emotional expressions: Probing the hyperactivating strategies underlying anxious attachment. Journal of Personality. 2006; 74(4):1163–1190. doi:10.1111/j.1467-6494.2006.00406.x. [PubMed: 16787432]

Fraley RC, Waller NG, Brennan KA. An item response theory analysis of self-report measures of adult attachment. Journal of Personality and Social Psychology. 2000; 78(2):350–365. doi:10.1037/0022-3514.78.2.350. [PubMed: 10707340]

Gendolla GHE. Self-relevance of performance, task difficulty, and task engagement assessed as cardiovascular response. Motivation and Emotion. 1999; 23(1):45–66.

Graham JE, Glaser R, Loving TJ, Malarkey WB, Stowell JR, Kiecolt-Glaser J. Cognitive word use during marital conflict and increases in proinflammatory cytokines. Health Psychology. 2009; 28(5):621–630. doi:10.1037/a0015208. [PubMed: 19751089]

Hetherington, EM.; Kelly, J. For better or for worse: Divorce reconsidered. New York, NY: W W Norton & Co; 2002.

Holmes TH, Rhae RH. The social readjustment rating scale. Journal of Psychosomatic Research. 1967; 11:213–218. [PubMed: 6059863]

Kiecolt-Glaser J, Fisher LD, Ogrocki P, Stout JC, Speicher CE, Glaser R. Marital quality, marital disruption, and immune function. Psychosomatic Medicine. 1987; 49(1):13–34. [PubMed: 3029796]

Kim Y. Gender, attachment, and relationship duration on cardiovascular reactivity to stress in a laboratory study of dating couples. Personal Relationships. 2006; 13(1):103–114. doi:10.1111/j.1475-6811.2006.00107.x.

Kotler T, Buzwell S, Romeo Y, Bowland J. Avoidant attachment as a risk factor for health. Journal of Medical Psychology. 1994; 67(3):237–245.

Kross, E. When the self becomes other: Toward an integrative understanding of the processes distinguishing adaptive self-reflection from rumination. In: Tobeña, A., editor. Values, empathy, and fairness across social barriers. New York, NY US: New York Academy of Sciences; 2009. p. 35-40.

Lucas RE. Time does not heal all wounds: A longitudinal study of reaction and adaptation to divorce. Psychological Science. 2005; 16(12):945–950. doi:10.1111/j.1467-9280.2005.01642.x. [PubMed: 16313658]

Mauss IB, Robinson MD. Measures of emotion: A review. Cognition and Emotion. 2009; 23(2):209–237. [PubMed: 19809584]

Mehrabian A. Attitudes inferred from non-immediacy of verbal communications. Journal of Verbal Learning & Verbal Behavior. 1967; 6(2):294–295. doi:10.1016/S0022-5371(67)80113-0.

Mikulincer, M.; Shaver, PR. The attachment behavioral system in adulthood: Activation, psychodynamics, and interpersonal processes. In: Zanna, MP., editor. Advances in experimental social psychology. Vol. vol. 35. San Diego, CA: Elsevier Academic Press; 2003. p. 53-152.

Mikulincer M, Shaver PR. Attachment theory and emotions in close relationships: Exploring the attachment-related dynamics of emotional reactions to relational events. Personal Relationships. 2005; 12(2):149–168. doi:10.1111/j.1350-4126.2005.00108.x.

Mikulincer, M.; Shaver, PR. Attachment in adulthood: Structure, dynamics, and change. New York, NY: Guilford Press; 2007.

Newman ML, Groom CJ, Handelman LD, Pennebaker JW. Gender differences in language use: An analysis of 14,000 text samples. Discourse Processes. 2008; 45:211–236.

Pennebaker JW, Graybeal A. Patterns of natural language use: Disclosure, personality, and social integration. Current Directions in Psychological Science. 2001; 10(3):90–93. doi: 10.1111/1467-8721.00123.

Pennebaker JW, King LA. Linguistic styles: Language use as an individual difference. Journal of Personality and Social Psychology. 1999; 77(6):1296–1312. doi:10.1037/0022-3514.77.6.1296. [PubMed: 10626371]

Pennebaker JW, Mayne TJ, Francis ME. Linguistic predictors of adaptive bereavement. Journal of Personality and Social Psychology. 1997; 72(4):863–871. doi:10.1037/0022-3514.72.4.863. [PubMed: 9108699]

Picardi A, Mazzotti E, Gaetano P, Cattaruzza MS, Baliva G, Melchi CF, Biondi M, Pasquini P. Stress, social support, emotional regulation, and exacerbation of diffuse plaque psoriasis. Psychosomatics: Journal of Consultation Liaison Psychiatry. 2005; 46(6):556–564. doi:10.1176/appi.psy.46.6.556.

Preacher KJ, Curran PJ, Bauer DJ. Computational tools for probing interaction effects in multiple linear regression, multilevel modeling, and latent curve analysis. Journal of Educational and Behavioral Statistics. 2006; 31:437–448.

Pressman SD, Cohen S. Use of social words in autobiographies and longevity. Psychosomatic Medicine. 2007; 69(3):262–269. doi:10.1097/PSY.0b013e31803cb919. [PubMed: 17420444]

Rohrbaugh MJ, Mehl MR, Shoham V, Reilly ES, Ewy GA. Prognostic significance of spouse we talk in couples coping with heart failure. Journal of Consulting and Clinical Psychology. 2008; 76(5): 781–789. doi:10.1037/a0013238. [PubMed: 18837595]

Roisman GI. The psychophysiology of adult attachment relationships: Autonomic reactivity in marital and premarital interactions. Developmental Psychology. 2007; 43(1):39–53. doi: 10.1037/0012-1649.43.1.39. [PubMed: 17201507]

Roisman GI, Tsai JL, Chiang KS. The emotional integration of childhood experience: Physiological, facial expressive, and self-reported emotional response during the adult attachment interview. Developmental Psychology. 2004; 40(5):776–789. doi:10.1037/0012-1649.40.5.776. [PubMed: 15355165]

Rossi P, Di Lorenzo G, Malpezzi MG, Di Lorenzo C, Cesarino F, Faroni J, Siracusano A, Troisi A. Depressive symptoms and insecure attachment as predictors of disability in a clinical population of patients with episodic and chronic migraine. Headache: The Journal of Head and Face Pain. 2005; 45(5):561–570. doi:10.1111/j.1526-4610.2005.05110.x.

Saffrey C, Ehrenberg M. When thinking hurts: Attachment, rumination, and postrelationship adjustment. Personal Relationships. 2007; 14(3):351–368. doi:10.1111/j.1475-6811.2007.00160.x.

Sbarra DA. Predicting the onset of emotional recovery following nonmarital relationship dissolution: Survival analyses of sadness and anger. Personality and Social Psychology Bulletin. 2006; 32(3): 298–312. doi:10.1177/0146167205280913. [PubMed: 16455858]

Sbarra DA, Emery RE. The emotional sequelae of nonmarital relationship dissolution: Analysis of change and intraindividual variability over time. Personal Relationships. 2005; 12(2):213–232. doi:10.1111/j.1350-4126.2005.00112.x.

Sbarra DA, Ferrer E. The structure and process of emotional experience following nonmarital relationship dissolution: Dynamic factor analyses of love, anger, and sadness. Emotion (Washington, D.C.). 2006; 6(2):224–238. doi:2006-07383-006 [pii]; 10.1037/1528-3542.6.2.224 [doi].

Sbarra DA, Law RW, Lee LA, Mason AE. Marital dissolution and blood pressure reactivity: Evidence for the specificity of emotional intrusion-hyperarousal and task-related emotional difficulty. Psychosomatic Medicine. 2009; 71(5):532–540. doi:10.1097/PSY.0b013e3181a23eee. [PubMed: 19414618]

Sbarra DA, Nietert PJ. Divorce and death: Forty years of the Charleston heart study. Psychological Science. 2009; 20:107–113. [PubMed: 19076315]

Shaver PR, Mikulincer M. Attachment-related psychodynamics. Attachment & Human Development. 2002; 4(2):133–161. doi:10.1080/14616730210154171. [PubMed: 12467506]

Singer JD. Using SAS PROC MIXED to fit multilevel models, hierarchical models, and individual growth models. Journal of Educational and Behavioral Statistics. 1998; 23:323–355.

Singer, JD.; Willett, JB. Applied longitudinal data analysis: Modeling change and event occurrence. New York, NY: Oxford University Press; 2003.

Slatcher RB, Vazire S, Pennebaker JW. Am 'I' more important than 'we'? couples' word use in instant messages. Personal Relationships. 2008; 15(4):407–424. doi:10.1111/j.1475-6811.2008.00207.x.

Sroufe LA, Waters E. Attachment as an organizational construct. Child Development. 1977; 48(4): 1184–1199. doi:10.2307/1128475.

Stapel DA, Semin G. The magic spell of language: Linguistic categories and their perceptual consequences. Journal of Personality and Social Psychology. 2007; 93(1):23–33. doi: 10.1037/0022-3514.93.1.23. [PubMed: 17605586]

Tausczik YR, Pennebaker JW. The psychological meaning of words: LIWC and computerized text analysis methods. Journal of Language and Social Psychology. 2010; 29(1):24–54. doi: 10.1177/0261927×09351676.

Tucker JS, Friedman HS, Wingard DL, Schwartz JE. Marital history at midlife as a predictor of longevity: Alternative explanations to the protective effect of marriage. Health Psychology. 1996; 15(2):94–101. doi:10.1037/0278-6133.15.2.94. [PubMed: 8681925]

Waugh CE, Fredrickson BL, Taylor SF. Adapting to life's slings and arrows: Individual differences in resilience when recovering from an anticipated threat. Journal of Research in Personality. 2008; 42(4):1031–1046. doi:10.1016/j.jrp.2008.02.005. [PubMed: 19649310]

Waugh CE, Panage S, Mendes WB, Gotlib IH. Cardiovascular and affective recovery from anticipatory threat. Biological Psychology. 2010 doi:10.1016/j.biopsycho.2010.01.010.

Whelton SP, Chin A, Xin X, He J. Effect of aerobic exercise on blood pressure: A meta-analysis of randomized, controlled trials. Annals of Internal Medicine. 2002; 136(7):493–503. [PubMed: 11926784]

Wright, RA. Brehm's theory of motivation as a model of effort and cardiovascular response. In: Gollwitzer, PM.; Bargh, JA., editors. The psychology of action: Linking cognition and motivation to behavior. New York, NY US: Guilford Press; 1996. p. 424-453.

Wright RA, Martin RE, Bland JL. Energy resource depletion, task difficulty, and cardiovascular response to a mental arithmetic challenge. Psychophysiology. 2003; 40(1):98–105. [PubMed: 12751807]

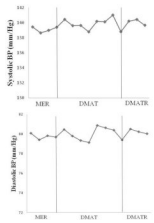

Figure 1.
Systolic and diastolic blood pressure (BP) scores across the three study periods: MER mundane events recall task (4 minutes); DMAT divorce-specific mental activation task (7 minutes); DMATR mental activation task recovery (4 minutes).

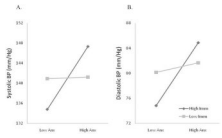

Figure 2.

Simple slopes depicting the two-way interaction between attachment anxiety and verbal immediacy predicting BP (SBP and DBP, Panel A & B, respectively) during the DMAT. Only high immediacy individuals evidenced significant simple slopes. High attachment anxiety individuals with high verbal immediacy (one standard deviation above the verbal immediacy mean) scores evidenced significantly higher BP during each minute of the DMAT. All variables in the model are continuous; for graphical purposes, changes are plotted for participants one standard deviation above and below the mean on attachment anxiety and verbal immediacy.

Table 1

Demographic Variables, Relationship Specific Covariates, Anxious Attachment and Verbal Immediacy: Correlations and Descriptive Statistics (N = 119)

Variables	1	2	3	4	5	6	7	8	9
1. Age	-								
2. Gross Income	.11**	-							
3. Length	.60**	.20**	-						
4. Separation	−.10**	.10**	−.07*	-					
5. Tobacco	.18**	.14**	.20**	.03	-				
6. High BP	.32**	.02	.17**	.03	−.02	-			
7. BMI	−.01	.04	.06	.03	−.04	.24**		-	
8. Anxiety	−.04	−.04	−.01	.10*	−.04	.19**	.24**		-
9. Immediacy	−.10**	−.21**	−.01	.00	−.11**	.06	.19**	.30**	
M	41.50	1.73	172.25	3.88	1.27	1.14	25.61	3.48	0
SD	9.60	.84	101.73	1.90	.45	.35	5.33	1.30	.70
Range	19–63	1–4	5–510	.5–11.50	1–2	1–2	17–47	1–6.11	−1.50—2.32

Note. Gross Income = approximate gross income (1=less than $30,000; 2= $30,000–$50,000; 3= $50,000 – $100,000; 4=greater than $100,000); Length = length of time in months participants were married before the separation; Separation = length of time rounded to the nearest half-month since the participant physically separated from partner; Tobacco = Does the participant use any form of tobacco including smoking cigarettes, pipes or cigars, and chewing tobacco (1=no; 2=yes); High BP = participant medical diagnosis of hypertension (1=no; 2=yes); BMI = body mass index; Anxiety = average attachment anxiety item-score; Verbal Immediacy = composite score of standardized LIWC variables I, discrepancy, present tense verbs, and the inverse score of article and six letter words.

* $p < .05$.

** $p < .01$.

Table 2

Unstandardized Parameter Estimates from Four Multilevel Models Assessing Change in Systolic (S) and Diastolic (D) Blood Pressure (BP) During the Divorce Specific Mental Activation Task (DMAT) (N = 119)

Variable	Model 1			Model 2			Model 3			Model 4			Model 5		
SBP	***B***	***SE***	***p***	***B***	***SE***	***p***	***B***	***SE***	***p***	***B***	***SE***	***p***	***B***	***SE***	***p***
Intercept	141.91	1.90	.0001	142.19	1.30	.0001	141.07	1.34	.0001	141.07	1.34	.0001	141.07	1.34	.0001
Age	.40	.22	.07	.52	.15	.001	.51	.15	.001	.51	.15	.001	.51	.15	.001
High BP				6.10	3.55	.09	5.48	3.49	.12	5.48	3.49	.12	5.48	3.49	.12
Anxiety	--	--	--	2.43	.92	.01	2.48	.91	.01	2.48	.91	.007	2.48	.91	.01
Immediacy	--	--	--	.87	1.73	.61	−.01	1.73	.99	−.01	1.73	.99	−.01	1.73	.99
Anxiety × Immediacy	--	--	--	--	--	--	3.38	1.26	.01	3.38	1.26	.008	3.38	1.26	.01
Time × Anxiety	--	--	--	--	--	--	−.06	.88	.95	−.06	.88	.95	--	--	--
Time x Immediacy	--	--	--	--	--	--	.01	1.58	.99	−.004	1.62	.99	--	--	--
Time × Anxiety × Immediacy	--	--	--	--	--	--	--	--	--	.04	1.21	.98	--	--	--

Variable	Model 1			Model 2			Model 3			Model 4			Model 5		
DBP	***B***	***SE***	***p***	***B***	***SE***	***p***	***B***	***SE***	***p***	***B***	***SE***	***p***	***B***	***SE***	***p***
Intercept	81.08	1.45	.0001	81.16	.98	.0001	80.37	1.02	.0001	80.37	1.02	.0001	80.37	1.02	.0001
Age	.19	.17	.26	.24	.12	.04	.24	.11	.04	.24	.11	.04	.24	.11	.04
High BP	6.15	3.87	.12	6.53	2.70	.02	6.09	2.66	.02	6.09	2.66	02	6.09	2.66	.02
Anxiety	--	--	--	2.20	.70	.002	2.23	.69	.001	2.24	.69	.001	2.23	.69	.001
Immediacy	--	--	--	−.14	1.31	.92	−.76	1.31	.56	−.76	1.31	.56	−.76	1.31	.56
Anxiety × Immediacy	--	--	--	--	--	--	2.36	.96	.01	2.36	.96	.01	2.36	.96	.01
Time × Anxiety	--	--	--	--	--	--	−.10	.66	.88	−.10	.66	.88			
Time × Immediacy	--	--	--	--	--	--	.08	1.19	.95	.09	1.21	.94	--	--	--
Time × Anxiety × Immediacy	--	--	--	--	--	--	--	--	--	−.03	.91	.97	--	--	--

Pers Relatsh. Author manuscript; available in PMC 2012 June 1.

Note. Covariates not meeting a minimum $p<.20$ cutoff have been removed for clarity. High BP = participant medical diagnosis of hypertension (1=no; 2=yes); Time = each minute of the DMAT which accounts for a linear change in BP across the 7-minute task; Anxiety = average attachment anxiety item-score; Immediacy = composite score of standardized LIWC variables I, discrepancy, present tense verbs, and the inverse score of article and six letter words.

Table 3

Unstandardized Parameter Estimates from the Multilevel Model Assessing Level of Systolic (S) and Diastolic (D) Blood Pressure (BP) During the Divorce Specific Mental Activation Task Recovery (DMATR) (N = 119)

	SBP			DBP		
Variable	***B***	***SE***	***p***	***B***	***SE***	***P***
Intercept	138.35	1.37	.0001	78.98	1.01	.0001
Age	.37	.15	.02	.12	.12	.32
High BP	11.62	3.60	.001	9.12	2.61	.001
Linear Effect of Time	1.17	1.15	.31	.99	.87	.26
Quadratic Effect of Time	−.36	.17	.04	−.28	.68	.06
Anxiety	2.76	.93	.004	2.06	.68	.003
Immediacy	−.88	1.75	.62	−1.77	1.30	.18
Anxiety × Immediacy	3.13	1.27	.02	2.70	.98	.01

Note. Covariates not meeting a minimum $p<.20$ cutoff have been removed for clarity. High BP = participant medical diagnosis of hypertension (1=no; 2=yes); Linear Time = each minute of the DMATR which accounts for a linear change in BP across the 4-minute task; Quadratic Time = Linear Time of DMATR squared to reflect increase and decrease in BP across the 4-minute task; Anxiety = average attachment anxiety item-score; Immediacy = composite score of standardized LIWC variables I, discrepancy, present tense verbs, and the inverse score of article and six letter words.