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Facing a breakup: Electromyographic responses moderate self-concept recovery following a romantic separation

ASHLEY E. MASON, **RITA W. LAW**, **AMANDA E. B. BRYAN**, **ROBERT M. PORTLEY**, and **DAVID A. SBARRA**

Department of Psychology, University of Arizona; Robert M. Portley, University of Arizona College of Medicine.

Abstract

Romantic breakups arouse fundamental questions about the self: *Who am I without my partner?* This study examined self-concept reorganization and psychological well-being over an 8-week period in the months following a breakup. Multilevel analyses revealed that poorer self-concept recovery preceded poorer well-being and was associated with love for an ex-partner, suggesting that failure to redefine the self contributes to post-breakup distress. Psychophysiological data revealed that greater activity in the corrugator supercilia facial muscle while thinking about an ex-partner predicted poorer self-concept recovery and strengthened the negative association between love for an ex-partner and self-concept recovery. Thus, the interaction between self-report and psychophysiological data provided information about the importance of self-concept recovery to post-breakup adjustment not tapped by either method alone.

When romantic relationships end, many people reflect on core questions about the self (Lewandowski, Aron, Bassis, & Kunak, 2006; Slotter, Gardner, & Finkel, 2010). Who am I now? Who are my friends? How did I spend my time before this relationship? There is little doubt that many aspects of the self-concept are inextricably linked to our romantic relationships (Aron, Aron, & Smollan, 1992; Aron, Aron, Tudor, & Nelson, 1991;

Aron, Paris, & Aron, 1995). Romantic relationships provide a critical social context for developing and refining perceptions of the self, and when these relationships end, people are often charged with redefining their self-concepts in the absence of their former partners. In the current study, we investigated the hypothesis that young adults' feelings of self-concept recovery following romantic breakups are important correlates of psychological well-being.

The dissolution of a romantic relationship is among life's most stressful and upsetting experiences (Maciejewski, Prigerson, & Mazure, 2001; Mazure, Bruce, Maciejewski, & Jacobs, 2000; Park, Cohen, & Murch, 1996; Sbarra, 2006). Romantic separations in young adulthood and late adolescence are associated with elevated risk for subsequent psychological distress, including the diagnosis of Major Depressive Disorder (Monroe, Rohde, Seeley, & Lewinsohn, 1999). Many studies have examined negative outcomes of romantic breakups as they relate to specific relationship factors (e.g., commitment to the

Correspondence should be addressed to Ashley E. Mason, Department of Psychology, University of Arizona, 1503 East University Blvd., Room 312, Tucson, AZ 85721-0068, mason1@email.arizona.edu..

relationship, duration of relationship, perceived closeness, satisfaction, perception of romantic alternatives; Frazier & Cook, 1993; Rusbult, 1980 1983; Simpson, 1987), nonspecific relationship factors (e.g., coping style, social support, self-esteem, mood-expectancies; Chung et al., 2003; Mearns, 1991), and the social context following a breakup (e.g., contact with an ex-partner; Sbarra & Emery, 2005). Few studies, however, have examined the role of changes in feelings about the self as mechanisms that may drive negative and/or positive outcomes following a separation experience.

Self-concept, romantic relationships, and psychological well-being

The social relationships and networks in which we are embedded shape how we understand and view ourselves (Aron et al., 1992). As our social environments change, so too can our feelings about ourselves. Numerous studies have demonstrated that the self-concept can change across individual situations (e.g., Ickes, Layden, & Barnes, 1978), social contexts such as culture (e.g., Spencer-Rodgers, Boucher, Mori, Wang, & Peng, 2009), and the status of our romantic relationships (e.g. Aron & Aron, 1997; Markus & Wurf, 1987).

A growing body of literature indicates that our self-concepts undergo dramatic changes both when we enter into (e.g., Aron et al., 1995) and leave (e.g., Slotter et al., 2010) romantic relationships. For example, Aron and colleagues (1991) found that when asked to distinguish between themselves and their spouses, married individuals experienced difficulty differentiating themselves from their partners, taking longer to respond to *me* or *not me* decisions about traits that they did not share with their spouses than they did about traits that they did share with their spouses. This finding suggests that romantic relationships change individuals' self-concepts in ways that render distinctions between self and partner less clear. Similarly, Agnew, Van Lange, Rusbult, and Langston (1998) found that increased commitment to a romantic relationship was associated with an increased use of plural pronouns (e.g., *we, us*) and view of the self as blended with the other. In a series of three studies, Lewandowski and colleagues (2006) found that among individuals in high-quality relationships (i.e., *self-expanding* relationships in which individuals reported motivation to enhance and grow their knowledge, identities, experiences, and capabilities; see Aron, Aron & Norman, 2004, for a review), breakups were associated with greater feelings of self-loss. Furthermore, in an investigation of the role of romantic breakups and self-loss in dysphoria, Drew, Heesacker, Frost, and Oelke (2004) found that more feelings of self-loss following a breakup were positively associated with more depressive symptoms. More recently, Slotter and colleagues (2010) found that romantic breakups were associated with decreased perceptions of the self as consistent and temporally stable, and that decreased self-concept clarity postbreakup predicted subsequent depressive symptoms. Taken together, the above studies indicate that self-concept recovery may represent an important determinant of psychological well-being after a romantic breakup.

What factors, then, facilitate or hinder self-concept recovery after a breakup? Research on unrequited love (i.e., unreciprocated romantic feelings) suggests that romantic rejection by a person to whom one is attracted is associated with decreased self-esteem. For example, Baumeister, Wotman, and Stillwell (1993) collected retrospective written narratives about people's experiences of (a) being romantically rejected and (b) rejecting someone who was

romantically interested in them. Nearly half (49.2%) of the narratives about being romantically rejected included statements suggesting lowered self-esteem, whereas virtually none (1.4%) of the narratives about rejecting someone else contained such statements. Similarly, 42.2% of narratives about being rejected contained self-enhancing statements (i.e., references to the writer's positive qualities), but only 7.1% of “rejector” narratives contained such statements. These findings suggest that the experience of being unable to have a desired lover elicits a need for subsequent rebuilding of the self, and that the restoration of self-esteem is a central task to recovering from unreciprocated love. As self-esteem is a significant component of the self-concept (Aron et al., 1995), the extent to which recently separated individuals continue to long for their ex-partners (suggestive of unrequited love) may similarly affect self-concept recovery.

Breakup adjustment: Moving beyond self-report

One of the main limitations of the existing research on psychological adjustment to a romantic breakup is its reliance on self-report measures. Self-reports can be useful but do not provide complete information about psychological responses to stressful life events (see Nielsen & Kaszniak, 2007). Mauss and Robinson (2009) state, “There is no ‘gold standard’ measure of emotional responding. Rather, experiential, physiological, and behavioural measures are all relevant to understanding emotion and cannot be assumed to be interchangeable” (p. 209).

Research in psychophysiology demonstrates that many aspects of psychological experience can be understood by studying physiological responses during emotionally evocative tasks (Larsen, Berntson, Poehlmann, Ito, & Cacioppo, 2008). Moreover, self-report and physiological data are often uncorrelated (e.g., Coifman, Bonanno, Ray, & Gross, 2007; Edelmann & Baker, 2002; Mauss, Levenson, McCarter, Wilhelm, & Gross, 2005; Mauss, Wilhelm, & Gross, 2004; Schwerdtfeger, 2004), yet both correlate with a given outcome variable, suggesting that there is additional value in research that incorporates both types of assessment. For example, Coifman and colleagues (2007) examined discrepancies across physiological and self-report measures to ascertain if the tendency to direct attention away from negative affective states promotes resilience following social loss. The authors found that self-report and psychophysiological measures of recently bereaved individuals were uncorrelated, and that greater discrepancy between these measures, known as the affective-autonomic response discrepancy (AARD; Bonanno, Keltner, Holen, & Horowitz, 1995), predicted less subsequent psychopathology, fewer health problems, and fewer somatic complaints. These findings exemplify the advantages of examining physiological and self-report measures within the context of each other. Hence, we have integrated these methods in the current study.

Among the array of physiological measures that can be used to investigate emotional experience, facial electromyography (EMG), the study of stimuli-linked electrical activity in specific facial muscles, has proven useful in a variety of settings. Cacioppo, Petty, Losch, and Kim (1986), for example, reported that facial EMG data collected from participants viewing visual stimuli revealed valenced emotions not observable to the naked eye. Visual inspections of participants’ videotapes did not reveal differences in facial expression as rated

by trained observers; however, facial EMG data indicated that activity in the corrugator muscle region (above the brow) was greater both when participants viewed unpleasant (opposed to pleasant) images and when images were moderately (opposed to mildly) unpleasant. Hence, measurements of corrugator activity may index negative emotional responding that is *not detectable* via self-report or observer ratings.

There is evidence that facial EMG is sensitive to unobservable emotional responding when individuals are instructed simply to *think about* or *visualize* emotionally charged situations. Vrana (1993) asked individuals to imagine situations eliciting a variety of emotions (anger, disgust, pleasure, joy) and to report their emotions after these imagery trials. Activity in the corrugator region characterized participants' experiences of negative emotions. In addition, differences in EMG activity across the labii superioris and alesque nasi regions (upper lip and nasal regions) distinguished anger from disgust despite the fact that the participants rated the stimuli as similar in anger and disgust. Similarly, Gehricke and Shapiro (2001) asked 43 depressed and nondepressed women to imagine happy and sad situations. Facial EMG profiles were significantly different between the sad and happy imageries in that activity over the corrugator region was greater during the sad imagery scenario for both depressed and nondepressed women.

Taken together, these studies suggest that facial EMG can be used profitably to investigate variability in emotional responding and that doing so may provide incremental information above and beyond self-report alone.

The present study

In the present study, we collected self-report self-concept recovery and psychological well-being data at each of eight laboratory visits over the course of 2 months following a romantic breakup. We used a breakup-related mental reflection task at the first laboratory visit to assess differences in facial EMG activities. Our view is that self-concept recovery represents an important outcome following a romantic breakup and is an important correlate of psychological well-being in general. Therefore, we explored a series of multilevel growth models using a measure of self-concept recovery as both a predictor and a criterion variable.

H1a

We first hypothesized that reports of less self-concept recovery (Lewandowski et al., 2006; Lewandowski & Bizzoco, 2007) at any given week would predict poorer psychological well-being the next week. In particular, we expected that this effect would operate over and above other competing predictors, or covariates (cf. Miller & Chapman, 2001), including initiator status (see Lewandowski & Bizzoco, 2007), participant gender, length of time since the separation, length of the relationship, and new relationship status.

H1b

Previous research investigating the association between the self-concept and postbreakup psychosocial outcomes has not permitted strong inferences about temporal precedence: Slotter and colleagues (2010) assessed psychological distress only at study intake and completion, and thus could not ascertain whether changes in the self-concept preceded or

followed changes in psychological well-being. By collecting data on all of the relevant variables at several occasions, we were able to conduct analyses incorporating lagged variables, thus building on their prior work in this area. To test the specificity of this hypothesis, we also examined the reverse model: We did not expect that reports of psychological well-being at any given week would predict self-concept recovery the next week.

H2

On the basis of the previous literature linking continued romantic feelings for a former partner and poorer psychological well-being following a breakup (e.g., Agnew et al., 1998; Simpson, 1987) and on the literature suggesting that unreciprocated love is associated with lowered self-esteem (e.g., Baumeister et al., 1993), we hypothesized that greater love for an ex-partner would be associated with less self-concept recovery over time.

H3

As discussed above, most studies of breakup adjustment and self-concept change have relied solely on self-report measures, raising concerns about inflated correlations due to overlapping method variance (cf. Campbell & Fiske, 1959). To address the limitations of self-report, we collected facial EMG data as another index of emotional responding. Given previous research indicating that increased electromyographical activity in the corrugator region is positively associated with experiencing sad stimuli (e.g., Gehricke & Shapiro, 2001) and negative emotional experience (e.g., Cacioppo et al., 1986), we wondered if a measure of corrugator supercilia activity might shed light on participants' experiences of self-concept recovery above and beyond self-report measures. Specifically, we predicted that increased corrugator activity would be associated with poorer self-concept recovery following a romantic breakup. Support for this hypothesis, combined with that for our hypothesis that changes in self-concept recovery precede changes in psychological well-being (H1a, H1b), would render a more complete picture of post-breakup psychological reorganization.

Finally, given previous findings that physiological and self-report measures may provide distinct information about a given construct (e.g., Cacioppo et al., 1986; Mauss & Robinson, 2009), we asked whether their interaction might be informative; for example, perhaps only when participants report strong feelings of love for their ex-partners *and* react strongly at a physiological level do we observe disruptions in their sense of self. Thus, we explored the extent to which facial EMG may moderate an association between maintaining romantic feelings for an ex-partner and self-concept recovery.

Method

Participants

Participants were 70 (22 men) college students at a large university in the Southwest United States (mean age = 18.91 years, *SD* = 99 years) who had experienced a romantic breakup an average of 4.2 months before entering the study (*SD* = 3.83 months). Participants were recruited by e-mail from a large undergraduate subject pool if they reported having

experienced a romantic separation in the preceding 6 months, and priority was given to those who reported more recent breakups or greater breakup-related distress. Participants reported having been in their previous relationships for an average of 21.04 months (*SD* = 15.50 months) and 48.6% of the sample indicated that they, rather than their partners, initiated the breakup. Forty-seven participants (67%) described themselves as White (non-Hispanic), 15 (21.4%) as Hispanic, 4 (5.7%) as Asian, 1 (1.4%) as Native American, and 3 (4.3%) as African American. All participants were given the opportunity to complete eight laboratory visits (24 completed all eight visits). Fifty-four participants (77.1%) reported being in a new relationship, 15 (21.4%) reported not being in a new relationship, and 1 (1.4%) did not report his or her current relationship status. Those who provided complete baseline data were included in the present analyses (in accordance with Singer and Willett's, 2003, stipulations for data included in multilevel analyses). Of the 70 participants who completed an initial laboratory visit, 53 provided intact physiological data (some data were lost due to equipment malfunction; see the Results section for attrition information).

Students received course credit for their participation. All aspects of the study were approved by the relevant human subject protection programs at the home institution.

Design

Participants completed laboratory visits individually. When they arrived for their first visit (T1), participants were told that the research team was trying to understand “how people adjust to a romantic breakup.” An experimenter then explained the structure of T1, which included physiological assessment and self-report questionnaires, and invited participants to participate in the longitudinal portion of the study involving seven 30-min weekly follow-up visits in which participants would complete self-report questionnaires for additional course credit or $10 per visit. Physiological assessment was not conducted at follow-up visits. Participants then completed the self-report measures described below. Next, an experimenter attached the facial EMG equipment to the participant and tasks were completed as described in the Procedure section. Physiological equipment was removed upon completion of the experimental session, and participants who opted not to return for follow-up assessments were debriefed. Those who opted to continue with follow-up visits scheduled their next visit with the experimenter.

Psychological measures and tasks

Breakup Mental Activation Task (BMAT)—During the BMAT (adapted from Sbarra, Law, Lee, & Mason, 2009), participants were asked to mentally reflect on the answers to seven questions presented on the computer screen in front of them related to their relationship history and romantic breakup experience. After each question was presented, participants were asked to “concentrate on the question by letting any relevant thoughts, feelings, or images come to mind” for a 1-min period. The BMAT items were ordered as follows: (a) Please think about how you and your ex-partner met. (b) Whose decision was it to end the relationship? Why? Please think about the events leading to the end of your relationship. (c) When did you first realize you and your partner were headed toward a breakup? What was that time like? (d) What do you remember about the breakup itself, the actual time during which the two of you decided to stop seeing each other? (e) How do you

think you've coped with this breakup? (f) How much have you seen your ex-partner since the breakup? What kind of contact have you had since ending your relationship? and (g) What's been the worst part about this breakup for you?

Task-Rated Emotional Difficulty (TRED)—We included this appraisal to enable us to statistically account for (a) the self-reported levels of distress experienced during the BMAT and (b) the degree to which participants were engaged in the task.[1] If participants were not fully engaging in the mental exercise, we might not expect to see evidence of physiological changes associated with breakup mental activation. The TRED included the following items (a) Overall, how upsetting did you find the task of thinking about all these questions? (b) How much effort did you make to control your emotions during this task? (c) How emotionally difficult did you find this task? and (d) How much anxiety/bodily tension did you experience during this task, and was administered directly following the BMAT? All items were assessed on a 7-point Likert scale. The TRED index was computed as a sum of the four items (M = 16.94, SD = 4.41) and had acceptable internal consistency (α = .72).

Loss of Self and Rediscovery of Self (LOSROS)—Lewandowski and Bizzoco (2007) developed two measures to assess loss of self (LOS) and rediscovery of self (ROS) after a romantic dissolution, respectively, and in the current study we used the composite of these two instruments as a measure of "self-concept recovery." LOS items were designed to "measure feelings of loss in the context of the self-concept," and ROS items were designed to "measure the extent to which participants felt they had become reacquainted with aspects of the self" (p. 44). The LOS and ROS scales were significantly negatively associated with each other and, respectively, were negatively and positively correlated with self-reported psychological growth following a romantic dissolution (Lewandowski & Bizzoco, 2007). The LOSROS combines the two 6-item scales into a 12-item scale. Items are assessed on a 7-point Likert scale ranging from 1 (*not at all*) to 7 (*a great deal*). Items in the LOS scale include, "I have lost my sense of self" and "I do not feel like myself anymore," and items in the ROS scale include "I have regained my identity" and "I have become reacquainted with the person I was before the relationship." The ROS was reverse scored prior to being combined with the LOS, and this combined measure served as a composite index of self-concept recovery. Higher scores indicate poorer self-concept recovery (T1 range = 15–68, SD = 13.19). The internal consistency of the LOSROS scale in the present sample was good (T1 α = .82). Raw LOSROS summed scores for each=visit appear in Figure 1.

Psychological Well-Being Scale (PWB)—The PWB is a modified version of Ryff's (1989) psychological well-being scale that originally contained 84 items. The modified version contains 22 items that are assessed on a 7-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Seven items are reverse scored, and higher scores indicate more positive self-ratings on the dimension assessed. Items gauge six areas of well-being: (a) positive relations with others, (b) self-acceptance, (c) autonomy, (d) personal growth, (e) environmental mastery, and (f) purpose in life. Each domain is represented in this shortened version by two or more items, and the alpha for the scale in the present study was strong (α

[1]The findings presented here do not change when TRED is removed from all analyses.

= .91). The PWB is intended to capture variability in well-being among relatively well-functioning individuals: A multilevel unconditional means model (SAS PROC MIXED) indicated significant variability across initial levels of PWB in the present sample (B = 124.45, $p < .00$). Inspection of responses to a number of items also demonstrates variability in this measure (range at T1 = 71–147, SD = 19.57). For example, 22.9% of the sample agreed or strongly agreed with the statement, "maintaining close relationships has been difficult and frustrating for me," and 44.3% disagreed or strongly disagreed with this statement. Similarly, 18.8% of the sample agreed or strongly agreed with the statement, "I often feel lonely because I have few close friends with whom to share my concerns," whereas 53.6% disagreed or strongly disagreed with this statement. Raw PWB summed scores for each visit appear in Figure 1.

Liking and Loving Scale (LLS)—Rubin's (1973) LLS consists of nine items that gauge the degree to which an individual is feeling loving, romantic feelings toward another person, in this case, the individual's ex-partner. Each item is rated on a 9-point Likert scale ranging from 1 (*I strongly disagree*) to 9 (*I strongly agree*). Items on this scale include, "If I were lonely, my first thought would be to seek them out" and "I would do almost anything for them." Higher scores indicate greater loving and romantic feelings toward an ex-partner (T1 range = 14–78, SD = 15.55). The internal consistency of the LLS in the present sample was good (T1 α = .83). Raw LLS summed scores for each visit appear in Figure 1.

Covariates—At the initial laboratory visit, in addition to basic demographic variables, participants reported on three relationship-specific variables that have previously been associated with postbreakup adjustment (see the Participants section): who initiated the end of the relationship (i.e., participant or partner; e.g., Kitson & Holmes, 1992; Sbarra, 2006; Wang & Amato, 2002), the length of the relationship (e.g., Simpson, 1987), and the length of time since the separation (Sbarra & Emery, 2005). Zero-order correlations and descriptive statistics for the Level 2 (L2; time-invariant) variables are displayed in Table 1.

Physiological measures

Corrugator supercilia (CORR)—Given previous research demonstrating increased activity in the corrugator supercilia muscle (above the brow) in response to situations inducing negative emotional experiences (e.g., Cacioppo et al., 1986), we collected facial EMG data over the corrugator supercilia muscle continuously throughout the BMAT. Electrode placement and recording were completed according to the guidelines described by Tassinary, Cacioppo, and Vanman (2007). The experimenter cleaned the area above the brow with electrode prep pads (Stens Corporation; stens-biofeedback.com) and exfoliated with LemonPrep skin prep (Mavidon Medical Products, mavidon.com). The experimenter filled 0.25 cm diameter surface Ag–AgCl electrodes with EGel conductance gel (Electrode Arrays; electrodearrays.com) and attached two electrodes, 1 cm apart, over the left corrugator supercilia, along with a ground electrode at the central midline of the forehead. All interelectrode impedances were reduced to less than 10 kΩ. EMG data were sampled continuously at a rate of 1,024 Hz and amplified by a factor of 20,000 with Biopac amplifiers (Biopac Systems Inc.). Bandpass filters were set at 0.1 Hz for the low-frequency amplitude and 1,000 Hz for the high-frequency amplitude so as to capture EMG signals that

may have ranged from a few Hz to 200 Hz or greater (see Tassinary et al., 2007). Data were processed offline using Mindware Technologies (Gahanna, Ohio) EMG 2.6 application. Signals were outputted minute-to-minute and averaged across the 7-min BMAT task, and we used this average (of the seven 1-min long questions) for the present analyses ($\alpha = .97$).

Procedure

Participants were asked to refrain from using tobacco and caffeine for at least 4 hr prior to T1. Upon arrival to the laboratory, participants completed self-report questionnaires (LOSROS, PWB, LLS) and a series of demographic questions. They were then seated in a physiological measurement chamber that included one computer, one speaker, and two video cameras for display of experimental stimuli and communication with the experimenter, who sat in an adjacent control room. After the experimenter affixed electrodes above the left eyebrow (corrugator supercilia), participants sat quietly while the experimenter cued stimuli from the adjacent control room. Participants watched a 4-min nature video while the experimenter ensured that the physiological signals were being collected and recorded properly, and then completed the BMAT followed by the TRED appraisal questions. The experimenter then removed the facial EMG equipment and scheduled participants' subsequent laboratory visits. For laboratory visits 2 through 8, participants returned to the laboratory and completed the self-report measures listed above.

Analytic strategy

Analysis—Data were analyzed using multilevel regression (see Preacher, Wichman, MacCallum, & Briggs, 2008; Singer & Willett, 2003) in SAS PROC MIXED (SAS System Version 9.2) under maximum likelihood (ML) estimation procedures. All analyses began by seeking to define the functional form of change in the self-report outcome in question. Two Level 1 (L1) models were fitted to each of two outcome variables ($LOSROS_{ij}$ and PWB_{ij}): (a) an unconditional means model, which assesses the extent to which the outcome varies over multiple occasions of measurement (but does *not* assess systematic variation or change), and (b) a linear growth model, which assesses systematic changes in the outcome variable over time. We rescaled $TIME_{ij}$, the L1 temporal predictor, by subtracting 1 (i.e., $TIME_{ij} - 1$) so that the intercept described the value of the outcome at the first occasion of measurement (T1). Given the autocorrelation in the data due to repeated measurements over time, we fitted the data with a first-order autoregressive error covariance parameter (Goldstein, Healy, & Rabash, 1994; Singer & Willett, 2003).

Across several models, we examined the effects of seven time-invariant (L2) covariates/predictors: participant sex (SEX), whether a participant or his or her ex-partner had initiated the separation (INITIATE), the length of the relationship (LENGTH); how long ago a participant and his or her ex-partner separated (SEPARATE), new relationship status (RELSTAT), task-rated emotional difficulty following the BMAT (TRED), and average corrugator response across all 7 min of the BMAT (CORR). SEPARATE and LENGTH were grand-mean centered, and INITIATE, SEX, and RELSTAT were coded 1 (self-initiate/male/no new relationship) and –1 (partner initiate/female/in a new relationship), respectively. All time-invariant covariates/predictors were entered into the models as fixed effects.

We also examined the effects of several time-varying (L1) predictors: self-concept recovery ($LOSROS_{ij}$), wherein participant *i*'s LOSROS score occurs at time *j*; a lagged self-concept recovery variable ($LOSROS_{i(j-1)}$) wherein participant *i*'s LOSROS score occurs at time $j - 1$ (1 week earlier); psychological well-being (PWB_{ij}); a lagged psychological well-being variable ($PWB_{i(j-1)}$); participants' self-reported love for their ex-partners (LLS_{ij}); and various representations of time, including linear ($TIME_{ij}$) and quadratic $\left(\mathrm{TIME}_{ij}^{2}\right)$ time functions. To facilitate interpretation, none of the L1 variables was centered.[2]

Results

Attrition

Of the 70 participants invited to return for additional study visits, the 52 participants who completed at least two study visits did not differ from the 18 participants who completed only one study visit with respect to any of the L1 variables or L2 covariates, SEX, $U = 480.0$, z .201, *ns*; T1 LOSROS, $t(68) = 1.12$, $p = .27$; T1 LLS, $t(68) = .50$, $p = .62$; T1 PWB, $t(68) = -1.10$, $p = .28$; TRED, $t(66) = -0.00$, $p = 1.00$; LENGTH, $t(68) = 0.22$. $p = .83$; INITIATE, $U = 529.0$, z = .95, *ns*; RELSTAT, U = 466.0, $z = .640$, *ns*; or SEPARATE, $t(68) = -0.43$, $p = .67$.

Unconditional means models

A series of unconditional means revealed substantial variability around the grand means for both LOSROS ($B = 36.44$, $p < .00$) and PWB ($B = 124.45$, $p < .00$). If models of systematic change (unconditional growth models) do not improve upon these unconditional means models, any change over time can be considered random error.

Unconditional growth models

In a series of unconditional growth models for PWB and LOSROS, we entered linear and quadratic TIME functions as fixed and random effects to study systematic change over the 8 weeks of the study. In an unconditional growth model for LOSROS, specified by the following equation, $Y_{ij} = \pi_{0j} + \pi_{1j}(\mathrm{TIME}) + r_{ij}$, the π_{0j} term represents the fixed intercept (β_{00}), which describes the average LOSROS score at the initial laboratory visit, with u_{0j} being the estimated random variation around this initial level. The π_{1j} term represents the fixed slope (β_{10}), which describes the rate of change across occasions, with u_{1j} being the estimated random variation around the slope. Significance tests of these parameters reveal whether participants varied in their initial level of a given variable and also potential patterns of change in that variable over time. Finally, the unconditional growth model includes a covariance parameter (r_{ij}) that describes the association between the initial level and rate of change.

[2]To preserve the metric of the predictor variables, none of the L1 variables was centered. For a review of centering in the context of hierarchical linear models, see Kreft, de Leeuw, and Aiken (1995) and Singer and Willett (2003).

LOSROS

In an unconditional growth model (intercept and time parameters only), both linear (B = −4.04) and quadratic (B = 0.35) time functions significantly predicted LOSROS over time (ps < .01) and were entered as both fixed and random effects. Participants entered the study with a mean score of 40.77, and there was significant random variation around this intercept (p < .00), which was allowed to vary randomly. Owing to non-independence of the data resulting from taking repeated measurements over time, we fitted an autoregressive error covariance structure to the data (Goldstein et al., 1994; Singer & Willett, 2003).

PWB

In an unconditional growth model (intercept and time parameters only), a linear (B = 2.41) but not quadratic (B = −0.17) time function significantly predicted PWB over time, and the linear parameter was entered as both a fixed and random effect. Participants entered the study with a mean score of 121.22, and there was significant random variation around this intercept (p < .00), which was allowed to vary randomly. For the same reason as above, we fitted an autoregressive error covariance structure to the data.

Conditional growth models

We then added covariates, main effects, and interaction effects for variables of interest to ascertain whether variations in the initial levels and slopes of PWB and LOSROS were related to other theoretically relevant variables. Results of the final model are presented in Table 2.

H1a—To test the hypothesis that reports of self-concept recovery at any given week would predict poorer psychological well-being the next week after accounting for self-concept recovery that next week as well as a number of relationship-specific covariates (see the Analytic Strategy section for covariate descriptions), we tested Model 1:

$$\begin{aligned} PWB_{ij} = {} & \pi_{0j} + \pi_{1j}\,(TIME_{ij}) + \pi_{2j}\,(SEX) + \pi_{3j}\,(SEPARATE) \\ & + \pi_{4j}\,(REL \quad LENGTH) \\ & + \pi_{5j}\,(INITIATE) \\ & + \pi_{6j}\,(LLS_{ij}) + \pi_{7j}\,(RELSTAT) \\ & + \pi_{8j}\,(LOSROS_{ij}) \\ & + \pi_{9j}\left(LOSROS_{i(j-1)}\right) + r_{ij} \end{aligned} \tag{1}$$

As predicted in H1a, participants who reported better self-concept recovery at any given week tended to report better psychological well-being the next week (B = −.12, SE = .06, p = .04) after accounting for self-concept recovery that next week (see Table 2, Model 1 for full model results). Support for this hypothesis represents a first step toward establishing a temporal association between self-concept recovery and psychological well-being.

H1b—To ascertain if reports of psychological well-being at any given week preceded self-concept recovery the next week (after accounting for psychological well-being that next week as well as a number of relationship-specific covariates), we tested Model 2:

$$\begin{aligned} LOSROS_{ij} = {} & \pi_{0j} + \pi_{1j}\,(TIME_{ij}) + \pi_{2j}\left(TIME^2\right) + \pi_{3j}\,(SEX) + \pi_{4j}\,(SEPARATE) \\ & + \pi_{5j}\,(REL \quad LENGTH) \\ & + \pi_{6j}\,(INITIATE) \\ & + \pi_{7j}\,(RELSTAT) \\ & + \pi_{8j}\,(LLS_{ij}) + \pi_{9j}\,(PWB_{ij}) + \pi_{10j}\left(PWB_{i(j-1)}\right) + r_{ij} \end{aligned} \tag{2}$$

As predicted in H1b, participants who reported better psychological well-being at any given week did not report poorer self-concept recovery the next week (B = .11, SE = .07, p = .11; see Table 2, Model 2 full model results).[3] To determine whether the degree to which a participant's self-reported continued love for his or her ex-partner was associated with subsequent well-being, we also tested lagged LLS models with both LOSROS and PWB as outcomes. Participants who reported fewer romantic feelings for an ex-partner at any given week did not tend to report better psychological well-being (B = .03, SE = .05, p = .58) or improved self-concept recovery (B = .02, SE = .05, p = .64) the next week.

H2 and H3—We tested both H2 and H3 with Model 3:[4]

$$\begin{aligned} LOSROS_{ij} = {} & \pi_{0j} + \pi_{1j}\,(TIME_{ij}) + \pi_{2j}\left(TIME^2\right) + \pi_{3j}\,(SEX) + \pi_{4j}\,(SEPARATE) \\ & + \pi_{5j}\,(REL \quad LENGTH) \\ & + \pi_{6j}\,(INITIATE) \\ & + \pi_{7j}\,(RELSTAT) \\ & + \pi_{8j}\,(TRED) + \pi_{9j}\,(PWB_{ij}) + \pi_{10j}\,(LLS_{ij}) + \pi_{11j}\,(CORR_{ij}) + r_{ij} \end{aligned} \tag{3}$$

H2—To assess whether participants' self-reported love for their ex-partners predicted self-concept recovery after accounting for psychological well-being and other relationship-specific covariates, we entered LLS as a time-varying fixed effect into Model 3. As shown in Table 3, Model 3, there was a time-varying main effect of LLS: Greater self-reported love for an ex-partner at each laboratory visit was associated with poorer self-concept recovery at that visit (B = .25, SE = .04, p = .00), supporting H2.

H3—To assess whether corrugator activity during the BMAT predicted self-concept recovery after accounting for psychological well-being and other relationship-specific covariates, we entered CORR as a time-invariant fixed effect into Model 3. As shown in Table 3, Model 3, there was a signifi-cant main effect of CORR on the model intercept: Greater corrugator activity during the BMAT was associated with poorer self-concept recovery (B = 1176.65, SE = 362.66,[5] p = .00).

[3]Given the high correlation between $LOSROS_{i(j-1)}$ and $LOSROS_{ij}$, entering both as random effects oversaturated the model. Thus, we allowed $LOSROS_{i(j-1)}$ to vary randomly, as it was the primary predictor of interest.

[4]The main effects of CORR and LLS were independent: When models with each variable were run separately, both CORR and LLS emerged as significant predictors of LOSROS.

[5]To ensure that the size of the standard error for CORR was not a statistical artifact, we inspected the range of the variable (0.0009 to 0.0085) and the standard deviation (0.0019) to ascertain that the value is logical. We then computed a Z-score transformation of the variable and regressed this transformed variable onto LOSROS. The predicted effect emerged in the same direction as what is reported here. We have chosen to report original (raw) metrics to facilitate interpretability.

Exploratory model

On the basis of the idea that a physiological index of participants' psychological state during the BMAT might moderate the course of emotional recovery throughout the follow-up period, we explored whether there was any effect of CORR on the association between LLS and LOSROS by testing Model 4:

$$\begin{aligned} LOSROS_{ij} = {} & \pi_{0j} + \pi_{1j}(TIME_{ij}) + \pi_{2j}\left(TIME^2\right) + \pi_{3j}(SEX) + \pi_{4j}(SEPARATE) \\ & + \pi_{5j}(REL \quad LENGTH) \\ & + \pi_{6j}(INITIATE) \\ & + \pi_{7j}(RELSTAT) \\ & + \pi_{8j}(TRED) + \pi_{9j}(PWB_{ij}) + \pi_{10j}(LLS_{ij}) + \pi_{11j}(CORR_{ij}) + \pi_{12j}(LLS_{ij}{}^{*}CORR_{ij}) + r_{ij} \end{aligned} \tag{4}$$

In addition to the main effects of LLS and CORR reported in H2 and H3, respectively, corrugator activity and love for an ex-partner interacted to predict self-concept recovery (B = −43.68, SE = 18.09,[6] p = .02; Table 3, Model 4). Simple slopes deconstruction of this interaction, displayed in Figure 2a, revealed that the association between LLS and LOSROS was significantly different across both low (−1 *SD*; z = 6.43, p < .00) and high (+1 *SD*; z = 3.40, p < .001) levels of corrugator activity. That is, greater love for an ex-partner, regardless of corrugator activity, was significantly associated with poorer self-concept recovery; however, the magnitude of the effect of LLS was significantly larger for those with *lower* corrugator activity (simple slope B = .34) than for those with *higher* corrugator activity (simple slope B = .17). Thus, the degree to which participants reported loving their ex-partners played a crucial role in their subsequent self-concept recovery, especially for those with lower corrugator activity.

To clarify the nature of this interaction, we then treated LLS as the moderator (Figure 2b). The association between CORR and LOSROS were significantly different across low (−1 *SD*; z = 4.02, p < .00) but not high (+1 *SD*; z = 1.12, p = .26) levels of love for an ex-partner. For those people reporting less love for their ex-partners, those with higher corrugator activity evidenced poorer self-concept recovery than those with less corrugator activity. For those reporting greater love for their ex-partners, however, corrugator activity did not predict differences in self-concept recovery.

Discussion

This study incorporated both self-report and physiological measures to assess (a) changes in young adults' feelings of self-concept recovery and (b) associations between self-concept recovery and psychological well-being in the wake of a romantic breakup. The temporal associations between feelings about the self and psychological well-being presented here extend previous findings (e.g., Slotter et al., 2010): Our data revealed a temporal direction of the association between self-concept recovery and psychological well-being such that participants reporting poorer self-concept recovery at any given week tended to report poorer psychological well-being the next week (after accounting for concurrent self-concept

[6] See Footnote 5.

recovery), but not vice versa (H1a, H1b). This suggests that changes in feelings about the self may be one mechanism driving postbreakup distress, and sheds new light on why some individuals recover better than others following romantic breakups. It may be useful for future studies of post-breakup adjustment to explore constructs that hinder or facilitate changes in feelings about the self.

Our analyses also indicated that greater self-reported love for an ex-partner at each laboratory visit was associated with poorer self-concept recovery at the same visit (H2). This finding dovetails nicely with previous research highlighting the association between continued love for an ex-partner and poorer psychological well-being (e.g., Sbarra, 2006; Simpson, 1987), and the association between unreciprocated love and decreases in self-esteem (e.g., Baumeister et al., 1993). It is possible that continued romantic feelings for an ex-partner inhibit the redefinition of the self because people who are still in love with their ex-partners may not be able to escape defining themselves in terms of their relationships. Prior research established that continued contact with an ex-partner is associated with poorer psychological outcomes (Sbarra & Emery, 2005), and one way in which contact may be associated with distress is by impairing individuals' senses of self as separate from their ex-partners. Importantly, in the present study, the association between romantic feelings for an ex-partner and self-concept recovery remained significant after statistically accounting for psychological well-being. Thus, it was *not* the case that those who reported greater romantic feelings for their ex-partners were simply unhappier (which, in turn, degraded their self-concepts), but rather that greater romantic feelings for ex-partners either exerted a direct, detrimental effect on self-concept recovery or an indirect effect that was mediated through other pathways.

Finally, we found that the use of facial EMG provided information not revealed by self-reports. At study intake, increased corrugator activity while thinking about an ex-partner was associated with poorer self-concept recovery. This effect operated over and above participants' self-reported emotional difficulty during the breakup mental activation task (as indexed by their TRED scores). The most precise interpretation is that participants who evidenced *more* corrugator activity than would have been predicted based on their degree of self-reported emotional difficulty started the study with feelings of less self-concept recovery. Thus, during an emotionally evocative task that ostensibly activated previous attachments to an ex-partner, corrugator activity provided information about participants' self-concept recovery beyond that provided by self-reports of other theoretically relevant variables (e.g., TRED scores, initiator status).

Our exploratory analysis revealed a moderation effect of corrugator activity on the association between love for an ex-partner and self-concept recovery. Across all levels of corrugator activity, participants showed a significant negative association between romantic feelings and self-concept recovery, but the strength of this association was stronger for those with higher corrugator activity than for those with less corrugator activity. We reversed the pairwise comparison (using love for an ex-partner as the moderator) to further investigate this effect. Among those who reported less love for an ex-partner, those who evidenced *higher* corrugator activity showed poorer self-concept recovery than those who evidenced *lower* corrugator activity. On the other hand, among those who reported more love for an ex-

partner, those who evidenced higher corrugator activity did not differ in self-concept recovery from those who evidenced lower corrugator activity. In summary, examining both sides of this interaction informed us about two pathways by which people experience self-concept recovery: (a) that the high LLS/low CORR group reported significantly worse self-concept recovery than the low LLS/low CORR group indicates that self-reported love for an ex-partner, regardless of what facial EMG reveals, significantly impacts self-concept recovery, and (b) that the low LLS/high CORR group reported significantly worse self-concept recovery than the low LLS/low CORR group indicates that facial activity also significantly impacts self-concept recovery, over and above the effects of self-reported feelings of love for an ex-partner.

This combination of moderation effects suggests two potential pathways leading away from self-concept recovery following a breakup. First, some people report greater love for their ex-partners; for this group, facial muscle movements do not additionally predict self-concept recovery, perhaps suggesting that continued love for an ex-partner is an overriding detriment to self-concept recovery. Using a daily diary method, Sbarra and Emery (2005) identified a group of people who consistently reported high levels of love for an ex-partner (after the breakup), and these people tended to fare poorly with respect to their overall adjustment to the breakup. Sbarra and Emery described these people as “stuck on love” (for their ex-partner), and, in the present study, we may be observing this pattern of adjustment in which, regardless of the affective responses in the body, these participants’ subjective feelings of love are highly linked to their self-concept recovery.

In contrast, we observed a second pattern of responding that may reflect a different pathway of adjustment: Some participants reported less love for their ex-partners, but during the BMAT, they evidenced higher corrugator activity. For these people, facial indicators of negative affect were associated with poorer self-concept recovery. Were these people suppressing their subjective emotional experiences (e.g., Gross, 1998), and/or is it the case that the BMAT revealed an aspect of their breakup adjustment that was outside of their conscious awareness? Either way, the corrugator activity revealed an underlying level of emotionality that participants were unable or, perhaps, unwilling to report. To the extent that these people were suppressing their subjective feelings of love for an ex-partner, this did not aid their self-concept recovery. The use of a physiological measure in tandem with a self-report measure provided an index of this potential emotional suppression process that we would not have observed if we had relied exclusively on self-report measures. Finally, with respect to the different pathways of adjustment, we note that the highest self-concept recovery was observed among people who reported less love for an ex-partner and evidenced less corrugator activity during the BMAT.

Limitations

First, the college student sample may afford limited generalizability for several reasons: It lacks diversity in age, the average relationship length is relatively short, and some of the breakups were likely due to geographical separation rather than personal rejection, which may affect the degree of self-concept loss associated with the breakup. Second, although we collected data about participants’ relationship status at study intake, we did not assess this

variable throughout the study. Future research should include more elaborate measures of current relationship status and experiences. Third, there was substantial attrition over the course of the eight study visits. This type of attrition-related limitation, however, is not uncommon in the longitudinal breakup literature (e.g., Sbarra et al., 2009). Fourth, in this sample, relationships had ended an average of 4.2 months before participation began, and evidence from previous research (Sbarra, 2006) suggests that individuals' self-reported adjustment may occur before 4 months have elapsed. Thus, it is possible that the trajectories we observed did not represent the main adjustment period for some participants. (At the same time, Slotter et al., 2010, found that the impact of a breakup on self-concept emerged less immediately and was still developing 13 weeks after the breakup; in this respect, the current work is a contribution as it demonstrates that self-concept is indeed still adjusting well beyond that time frame.) Finally, the total sample size in this study was relatively small, and efforts should be made to replicate this work with a larger sample.

Conclusion

Future research on adjustment to romantic breakups may benefit by incorporating two aspects of the current study. First, longitudinal designs with more than two data points are advantageous: Repeated assessments allowed us to establish the directionality of correlational associations by examining temporal precedence, and while this still does not afford causal inferences, it can implicate causality more strongly than cross-sectional designs. Second, including physiological measures allowed us to learn more about their associations with self-report measures and provided additional information that could not have been gleaned through self-reports. Our finding that corrugator activity is associated with self-concept recovery above and beyond participants' self-reports of emotional distress during the BMAT highlights the strength of this multimethod research.

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References

Agnew CR, Van Lange PAM, Rusbult CE, Langston CA. Cognitive interdependence: Commitment and the mental representation of close relationships. Journal of Personality and Social Psychology. 1998; 74:939–954.

Aron, A.; Aron, EN. Self-expansion motivation as including the other in the self.. In: Duck, S., editor. Handbook of personal relationships: Theory, research, and interventions. 2nd ed.. Wiley; Chichester, UK: 1997. p. 251-270.

Aron, A.; Aron, EN.; Norman, C. Self-expansion model of motivation and cognition in close relationships and beyond.. In: Brewer, MB.; Hewstone, M., editors. Self and social identity. Blackwell; Malden, MA: 2004. p. 99-123.

Aron A, Paris M, Aron EN. Falling in love: Prospective studies of self-concept change. Journal of Personality and Social Psychology. 1995; 69:1102–1112.

Aron A, Aron EN, Smollan D. Inclusion of other in the self scale and the structure of interpersonal closeness. Journal of Personality and Social Psychology. 1992; 63:596–612.

Aron A, Aron EN, Tudor M, Nelson G. Close relationship as in including other in the self. Journal of Personality and Social Psychology. 1991; 60:241–253.

Baumeister RF, Wotman SR, Stillwell AM. Unrequited love: On heartbreak, anger, guilt, scriptlessness, and humiliation. Journal of Personality and Social Psychology. 1993; 64:377–394.

Bonanno GA, Keltner D, Holen A, Horowitz MJ. When avoiding unpleasant emotions might not be such a bad thing: Verbal-autonomic response dissociation and midlife conjugal bereavement. Journal of Personality and Social Psychology. 1995; 69:975–989. [PubMed: 7473042]

Cacioppo JT, Petty RE, Losch ME, Kim HS. Electromyographic activity over facial muscle regions can differentiate the valence and intensity of affective reactions. Journal of Personality and Social Psychology. 1986; 50:260–268. [PubMed: 3701577]

Campbell DT, Fiske DW. Convergent and discriminant validation by the multitrait–multimethod matrix. Psychological Bulletin. 1959; 56:81–105. [PubMed: 13634291]

Chung MC, Farmer S, Grant K, Newton R, Payne S, Perry M, Stone N. Self-esteem, personality and post traumatic stress symptoms following the dissolution of a dating relationship. Stress and Health. 2003; 18:83–90.

Coifman KG, Bonanno GA, Ray RD, Gross JJ. Does repressive coping promote resilience? Affective-autonomic response discrepancy during bereavement. Journal of Personality and Social Psychology. 2007; 92:745–758. [PubMed: 17469956]

Drew SS, Heesacker M, Frost HM, Oelke LE. The role of relationship loss and self-loss in women's and men's dysphoria. Journal of Social and Personal Relationships. 2004; 21:381–397.

Edelmann RJ, Baker SR. Self-reported and actual physiological responses in social phobia. British Journal of Clinical Psychology. 2002; 41:1–14. [PubMed: 11931674]

Frazier P, Cook S. Correlates of distress following heterosexual relationship dissolution. Journal of Social and Personal Relationships. 1993; 10:55–67.

Gehricke JG, Shapiro D. Facial and autonomic activity in depression: Social context differences during imagery. International Journal of Psychophysiology. 2001; 41:53–64. [PubMed: 11239697]

Goldstein H, Healy MJR, Rasbash J. Multilevel time series models with applications to repeated measures data. Statistics in Medicine. 1994; 13:1643–1655. [PubMed: 7973240]

Gross J. Antecedent- and response-focused emotion regulation: Divergent consequences for experience, expression, and physiology. Journal of Personality and Social Psychology. 1998; 74:224–237. [PubMed: 9457784]

Ickes W, Layden MA, Barnes RD. Objective self-awareness and individuation: An empirical link. Journal of Personality. 1978; 46:146–161. [PubMed: 650377]

Kitson, GC.; Holmes, WM. Portrait of divorce: Adjustment to marital breakdown. Guilford; New York: 1992.

Kreft IGG, de Leeuw J, Aiken LS. The effect of different forms of centering in hierarchical linear models. Multivariate Behavioral Research. 1995; 30:1–21.

Larsen, JT.; Berntson, GG.; Poehlmann, KM.; Ito, TA.; Cacioppo, JT. The psychophysiology of emotion.. In: Lewis, M.; Haviland-Jones, JM.; Barrett, LF., editors. Handbook of emotions. 3rd ed.. Guilford; New York: 2008. p. 180-195.

Lewandowski GW, Aron A, Bassis S, Kunak J. Losing a self-expanding relationship: Implications for the self-concept. Personal Relationships. 2006; 13:317–331.

Lewandowski GW, Bizzoco NM. Addition through subtraction: Growth following the dissolution of a low quality relationship. Journal of Positive Psychology. 2007; 2:40–54.

Maciejewski PK, Prigerson HG, Mazure CM. Sex differences in event-related risk for major depression. Psychological Medicine. 2001; 31:593–604. [PubMed: 11352362]

Markus H, Wurf E. The dynamic self concept: Social psychological perspective. Annual Reviews of Psychology. 1987; 38:299–337.

Mauss IB, Levenson RW, McCarter L, Wilhelm FH, Gross JJ. The tie that binds? Coherence among emotion experience, behavior, and physiology. Emotion. 2005; 5:175–190. [PubMed: 15982083]

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

Mauss IB, Wilhelm FH, Gross JJ. Is there less to social anxiety than meets the eye? Emotion experience, expression, and bodily responding. Cognition & Emotion. 2004; 18:631–662.

Mazure CM, Bruce ML, Maciejewski PK, Jacobs SC. Adverse life events and cognitive-personality characteristics in the prediction of major depression and anti-depressant response. American Journal of Psychiatry. 2000; 157:896–903. [PubMed: 10831468]

Mearns J. Coping with a breakup: Negative mood regulation expectancies and depression following the end of a romantic relationship. Journal of Personality and Social Psychology. 1991; 60:327–334. [PubMed: 2016673]

Miller GA, Chapman JP. Misunderstanding analysis of covariance. Journal of Abnormal Psychology. 2001; 110:40–48. [PubMed: 11261398]

Monroe SM, Rohde P, Seeley JR, Lewinsohn PM. Life events and depression in adolescence: Relationship loss as a prospective risk factor for first onset of major depressive disorder. Journal of Abnormal Psychology. 1999; 108:606–614. [PubMed: 10609425]

Nielsen, L.; Kaszniak, AW. Conceptual, theoretical, and methodological issues in inferring subjective emotion experience.. In: Coan, JA.; Allen, JJB., editors. Handbook of emotion elicitation and assessment. Oxford University Press; New York: 2007. p. 361-378.

Park CL, Cohen LH, Murch R. Assessment and prediction of stress related growth. Journal of Personality. 1996; 64:71–105. [PubMed: 8656319]

Preacher, KJ.; Wichman, AL.; MacCallum, RC.; Briggs, NE. Latent growth curve modeling. Sage; Thousand Oaks, CA: 2008.

Rubin, Z. Liking and loving: An invitation to social psychology. Holt, Rinehart, & Winston; New York: 1973.

Rusbult C. Commitment and satisfaction in romantic associations: A test of the investment model. Journal of Experimental Social Psychology. 1980; 16:172–186.

Rusbult C. A longitudinal test of the investment model: The development (and deterioration) of satisfaction and commitment in heterosexual involvements. Journal of Personality and Social Psychology. 1983; 45:101–117.

Ryff CD. Happiness is everything, or is it? Explorations on the meaning of psychological well-being. Journal of Personality and Social Psychology. 1989; 57:1069–1081.

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

Sbarra DA, Emery R. The emotional sequelae of nonmarital relationship dissolution: Analysis of change and intraindividual variability over time. Personal Relationships. 2005; 12:213–232.

Sbarra DA, Law RW, Lee LA, Mason AE. Marital dissolution and blood pressure reactivity: Evidence for the specificity of emotional intrusion-hyperarousal and task-rated emotional difficulty. Psychosomatic Medicine. 2009; 71:532–540. [PubMed: 19414618]

Schwerdtfeger A. Predicting autonomic reactivity to public speaking: Don’t get fixed on self-report data! International Journal of Psychophysiology. 2004; 52:217–224. [PubMed: 15094245]

Simpson J. The dissolution of romantic relationships: Factors involved in relationship stability and emotional distress. Journal of Personality and Social Psychology. 1987; 53:683–692.

Singer, JD.; Willett, JB. Applied longitudinal data analysis. Oxford University Press; New York: 2003.

Slotter EB, Gardner WL, Finkel EJ. Who am I without you? The influence of romantic breakup on the self-concept. Personality and Social Psychology Bulletin. 2010; 36:147–160. [PubMed: 20008964]

Spencer-Rodgers J, Boucher HC, Mori SC, Wang L, Peng K. The dialectical self-concept: Contradiction, change, and holism in East Asian cultures. Personality and Social Psychology Bulletin. 2009; 35:29–44. [PubMed: 19106076]

Tassinary, LG.; Cacioppo, JT.; Vanman, EJ. The skeletomotor system: Surface electromyography.. In: Cacioppo, JT.; Tassinary, LG.; Berntson, GG., editors. Handbook of psychophysiology. 3rd ed.. Cambridge University Press; New York: 2007. p. 267-299.

Vrana SR. The psychophysiology of disgust: Differentiating negative emotional contexts with facial EMG. Psychophysiology. 1993; 30:279–286. [PubMed: 8497557]

Wang H, Amato PR. Predictors of divorce adjustment: Stressors, resources, and definitions. Journal of Marriage and Family. 2000; 62:655–668.

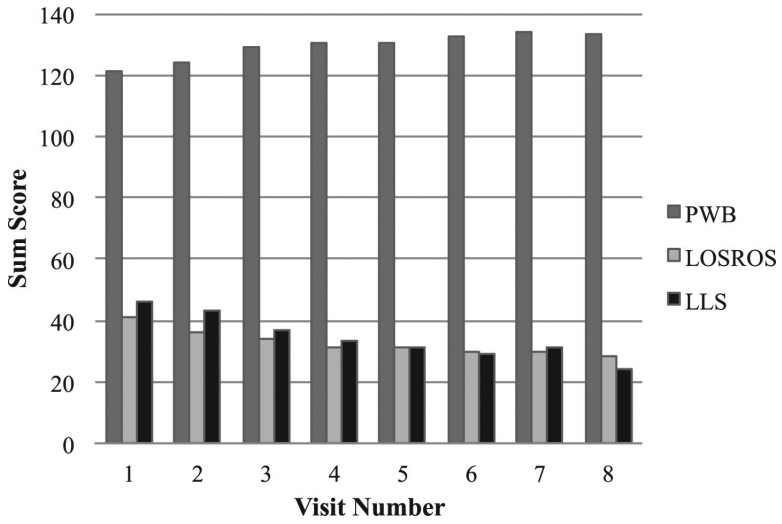

Figure 1.

Raw Psychological Well-Being (PWB), Loss of Self and Rediscovery of Self (LOSROS), and Liking and Loving Scale (LLS) scores at each laboratory visit.

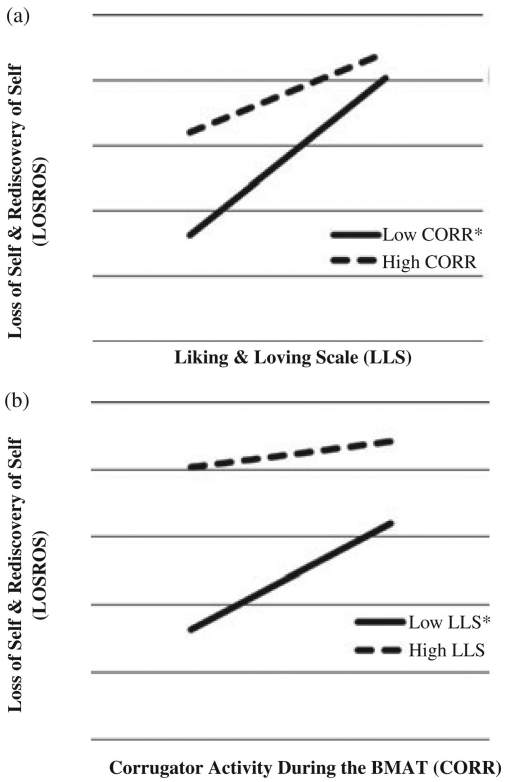

Figure 2.

(a) Simple slopes deconstruction of interaction of CORR × LLS showing that the association between self-reported continued romantic feelings toward an ex-partner (LLS) and psychological distress (IES) depends on one's level of corrugator reactivity (CORR) during the BMAT. (b) Simple slopes deconstruction of interaction of CORR × LLS showing that the association between corrugator activity during the BMAT (CORR) and psychological distress (IES) depends on one's level of self-reported continued romantic feelings toward an ex-partner (LLS). *p = .001.

Table 1

Correlations of Level 2 variables

Parameter	SEX	CORR	TRED	INITIATE	SEP	LENGTH	RELSTAT
SEX	—						
CORR	0.44**	—					
TRED	0.41*	0.39*	—				
INITIATE	–0.06	0.08	0.11	—			
SEP	–0.11	–0.06	–0.05	0.00	—		
LENGTH	–0.33	–0.25	–0.11	0.12	0.25	—	
RELSTAT	0.06	–0.11	–0.02	0.13	–0.05	0.17	—
M	0.37	0.0034	16.49	–0.03	3.95	21.13	–0.55
SD	0.94	0.0019	4.87	1.01	3.92	15.95	0.83

Note.*SEX* = participant sex (—1 = male, 1 = female); CORR = average corrugator activity during BMAT; TRED = participant appraisal of emotional difficulty/involvement during physiological assessment; INITIATE = who initiated end of relationship (— 1 = partner, 1 = participant); SEP = time since physical separation in months; RELSTAT = relationship status (— 1 = not in a new relationship, 1 = in a new relationship); LENGTH = relationship length in months.

* $p < .05$.

** $p < .01$.

Table 2

Multilevel results predicting LOSROS and PWB using full maximum likelihood estimation (Model 1, N = 52; Model 2, N = 52)

Dependent variable	Parameter	Var level	*B*	*df*	*SEB*	*T*	*p*
PWB Model 1	Intercept	—	139.96	46	3.78	37.02	.00
	$TIME_{ij}$	1	–.01	45	1.31	.00	.99
	REL LENGTH	2	.00	162	.10	.02	.98
	SEP	2	–.23	162	.38	–.63	.53
	SEX	2	.64	162	1.65	.39	.70
	INITIATE	2	–.3.11	162	1.47	–2.11	.04
	RELSTAT	1	–3.26	162	1.80	–1.80	.07
	LLS_{ij}	1	–.04	162	.05	–.73	.50
	PWB_{ij}	1	–.30	162	.06	–5.06	.00
	$PWB_{i(j–1)}$	1	–.12	162	.06	–2.10	.04
LOSROS Model 2	Intercept	—	39.21	46	5.44	7.21	.00
	TIMEij	1	–.33	45	1.09	–.31	.76
	$TIME_{ij}$*$TIME_{ij}$	1*1	–.01	39	.15	–.07	.95
	REL LENGTH	2	–.23	122	.05	–5.23	.00
	SEP	2	–.10	122	.17	–.58	.56
	SEX	2	–.24	122	.72	–.33	.75
	INITIATE	2	–.87	122	.64	–1.37	.17
	RELSTAT	1	.29	122	.80	.37	.72
	LLS_{ij}	1	.28	122	.04	7.55	.00
	$LOSROS_{ij}$	1	–.22	122	.07	–3.35	.00
	$LOSROS_{i(j–1)}$	1	.11	122	.07	1.62	.11

Note. Akaike information criterion fit statistic for Model 1 = 1920.7, Model 2 = 1879.5. See Table 1 for L2 variable descriptions. PWB_{ij} = Psychological Well-Being scale; LLS_{ij} = Liking and Loving Scale; $LOSROS_{ij}$ = Loss of Self and Rediscovery of Self scale; $PWB_{i(j–1)}$ = PWB lagged by 1 week; $LOSROS_{i(j–1)}$ = LOSROS lagged by 1 week.

Table 3

Multilevel main effect (Model 3) and interactive (Model 4) results predicting LOSROS using full maximum likelihood estimation (Model 3, N = 52; Model 4, N = 52)

Dependent variable	Parameter	Var level	*B*	*df*	*SE B*	*T*	*p*
LOSROS Model 3	Intercept	—	57.93	44	5.00	11.58	.00
	$TIME_{ij}$	1	–2.18	37	.77	–2.83	.01
	$TIME_{ij}$*$TDME_{ij}$	1*1	.23	33	.12	1.88	.07
	REL LENGTH	2	–.20	116	.05	–4.13	.00
	SEP	2	–.22	116	.16	–1.36	.18
	SEX	2	–2.80	116	.77	–3.63	.00
	INITIATE	2	–1.85	116	.65	–2.87	.02
	RELSTAT	1	1.14	116	.79	1.44	.15
	TRED	2	.43	116	.14	3.14	.00
	PWB_{ij}	1	–.22	116	.04	–5.59	.00
	LLS_{ij}	1	.25	116	.04	3.24	.00
	CORR	2	1, 176.65	116	362.66	6.45	.00
LOSROS Model 4	Intercept	—	57.24	44	4.96	11.55	.00
	$TIME_{ij}$	1	–2.29	37	.76	–3.01	.00
	$TIME_{ij}$*$TIME_{ij}$	1*1	.24	33	.12	1.99	.06
	REL LENGTH	2	–.19	115	.05	–3.90	.00
	SEP	2	–.23	115	.16	–1.46	.15
	SEX	2	–3.01	115	.77	–3.92	.00
	INITIATE	2	–1.90	115	.64	–2.97	.00
	RELSTAT	1	1.41	115	.79	1.77	.08
	TRED	2	.42	115	.14	3.09	.00
	PWB_{ij}	1	–.21	115	.04	–5.46	.00
	LLS_{ij}	1	.26	115	.04	6.62	.00
	CORR	2	2, 872.72	115	789.6	3.64	.00
	CORR*LLS	2*1	–43.68	115	18.09	–2.42	.02

Note. The Akaike information criterion fit statistic for Model 3 = 1721.1, Model 4 = 1717.3. See Tables 1 and 2 for variable descriptions.