Emotion
2008, Vol. 8, No. 3, 419–424

1528-3542/08/$12.00 DOI: 10.1037/1528-3542.8.3.419

Effects of Acceptance-Oriented Versus Evaluative Emotional Processing on Heart Rate Recovery and Habituation

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The effects of emotional processing on stress response trajectories may depend on the nature of processing, as evaluative rumination about emotions can prolong distress. In contrast, observing negative emotions in an accepting manner may promote efficient recovery from stressful situations. The present study examined the effect of acceptance-oriented versus evaluative emotional processing on cardiovascular habituation and recovery. Across two experimental sessions, 81 participants were randomly assigned to write about an ongoing stressful experience while either (1) evaluating the appropriateness of their emotional response (EVAL), (2) attending to their emotions in an accepting way (ACC), or (3) describing the objective details of the experience (CTL). Heart rate was assessed continuously throughout baseline, writing, and recovery. Results suggest that writing about emotions in an evaluative way leads to less efficient heart rate habituation and recovery than processing emotions in an accepting manner. These findings highlight a potential mechanism of mindfulness- and acceptance-based interventions' effects on health outcomes and further suggest that habitually evaluating the appropriateness of one's emotional responses rather than accepting them as they unfold may have consequences for cardiovascular health.

Keywords: emotional responses, acceptance, heart rate, psychophysiology

Negative emotions are a common reaction to stressful experiences, and different approaches to processing these emotions may have distinct consequences for the stress response trajectory. For example, ruminative brooding about a stressor and the appropriateness of one's emotional response to it can exacerbate and prolong suffering as well as delay physiological recovery from stress (Brosschot, Pieper, & Thayer, 2005; Glynn, Christenfeld, & Gerin, 2002; Nolen-Hoeksema & Morrow, 1993). At the same time, suppressing emotion-related thoughts or expressive behavior also intensifies subjective and physiological arousal in the short-term (Gross & Levenson, 1997) and impairs psychological and interpersonal functioning when suppression is chronic (Campbell-Sills, Barlow, Brown, & Hofmann, 2006a; Gross & John, 2003). Other lines of evidence suggest that active attempts to acknowledge, understand, and express emotions are associated with enhanced well-being and attenuated distress in stressful contexts (Austenfeld & Stanton, 2004; Stanton, Kirk, Cameron, & Danoff-Burg, 2000), and experimentally induced writing about stress-related emotions produces psychological and physical health benefits (Frattaroli, 2006; Pennebaker & Beall, 1986; Smyth, 1998). Thus, emotional processing can be either helpful or harmful, and the consequences of attending to emotions may depend on the nature of emotional processing.

Empirical evidence suggests that the most pernicious component of rumination is negative evaluation of one's emotions (Rude, Maestas, & Neff, 2007; Watkins, 2004). One recent study reported that for a measure of rumination, the items most highly correlated with distress were those reflecting negative evaluation of emotions, whereas adapting this measure to minimize aspects of self-criticism and judgment resulted in a subscale of rumination that was not significantly associated with depressive symptoms (Rude et al., 2007). Consistent with these data, the theory underlying Acceptance and Commitment Therapy (ACT) suggests that the persistence of emotional distress results from the judgment that a feeling is unacceptable, leading to maladaptive efforts to control or avoid experiencing negative emotions (Hayes, Strosahl, & Wilson, 1999). Indeed, a lack of acceptance and openness to feelings may underlie the harmful effects of both suppression (Campbell-Sills et al., 2006a) and ruminative brooding (Trapnell & Campbell, 1999). Thus, emotional processing that is acceptance-oriented represents the converse of negatively evaluating emotions, with potentially distinct effects on the stress response trajectory. Intentionally allowing oneself to experience and observe negative emotions may both promote efficient recovery from distressing situations (Eifert & Heffner, 2003; Kabat-Zinn et al., 1992) and represent a process of exposure, facilitating habituation of emotional and physiological responses across repeated presentations of a stressor (Foa & Kozak, 1986; Mendolia & Kleck, 1993; Stanton et al., 2000, Study 4). In contrast, evaluating the appropriateness of one's emotional response might both prolong reactivity and prevent the experiential exposure to negative emotions necessary to allow habituation of reactivity when emotional stimuli are next encountered.

Only a handful of experimental studies have examined effects of emotional acceptance on subjective and physiological aspects of the emotional response. One experiment provided either an accep-

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This work was supported by a National Science Foundation Graduate Research Fellowship. We thank Ashley Moskovich, Daniel Dickson, Shari Green, Sue Lam, Daisy Tsao, and Mikey Garcia for their valuable help with this project.

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tance or control context (i.e., reduce symptoms via diaphragmatic breathing) before exposing anxiety sensitive participants to an anxiogenic stimulus. While the acceptance context promoted less subjective fear and fewer catastrophic thoughts, no group differences in heart rate (HR) or skin conductance reactivity were observed (Eifert & Heffner, 2003). In another study, anxious participants were instructed to either accept or suppress their emotional reactions to a film; the acceptance group demonstrated better recovery from an increase in self-reported negative emotion following the film and decreased HR during the film (Campbell-Sills, Barlow, Brown, & Hofmann, 2006b). To our knowledge, no previous research has compared emotional acceptance to evaluative emotional processing, and no study has examined the effects of acceptance or evaluative emotional approach on habituation of response across multiple experimental sessions.

The goal of the present study was to examine the effect of accepting versus evaluative emotional processing on HR habituation and recovery among nonclinical participants. Acceptance is an important component of mindfulness-based interventions, which emphasize both awareness of and an accepting, nonjudgmental attitude toward emotions (Bishop, 2002). Thus, understanding the acute physiological effects of experimentally induced acceptance may illuminate potential mechanisms underlying these therapeutic interventions and their physical health benefits (Carlson, Speca, Patel, & Goodey, 2003; Davidson et al., 2004). We were particularly interested in habituation and recovery processes, both for their relevance to understanding the trajectory of the stress response and for their potential clinical significance, as prolonged and repeated cardiovascular activation in response to psychosocial stressors is gaining increased attention as a predictor of morbidity and mortality (McEwen, 1998; Steptoe & Marmot, 2006; Strike et al., 2004).

Relative to negatively evaluating one's emotions or writing about the facts of a stressful experience, we predicted that writing about emotions in an accepting manner would be associated with (1) faster HR recovery following both writing sessions, and (2) greater HR habituation across sessions, indicated by decreased reactivity to writing during Session 2. We expected the differences between the acceptance and evaluation conditions to be most pronounced, given the potentially detrimental effects of evaluation on physiological recovery and habituation. Although we were primarily interested in HR, we also conducted exploratory analyses to investigate whether writing about emotions in an accepting way would result in (3) increased positive and decreased negative self-reported mood and (4) use of more positive and fewer negative emotion words, relative to the evaluative processing group. Finally, we investigated whether differences in mood reactivity or essay content might mediate any effects of experimental condition on heart rate measures.

Method

Participants

Eighty-five undergraduate students participated in the experiment for course credit. Participants were eligible for the study if they were comfortable reading and writing in English. Four subjects did not return for a second experimental session (one in the Acceptance group, one in the Control group, and two in the Evaluation group), yielding 81 participants (58% female). Participants had a mean age of 20.6 years (SD = 4.08, range = 17–46) and were ethnically diverse (43% Asian, 35% Caucasian, 17% Hispanic, and 5% other).

Procedure

Undergraduate students were recruited through a designated website in the psychology department or posted flyers on campus. In Session 1, conducted individually, participants provided informed consent and completed baseline questionnaires. At that time, participants also nominated their most stressful situation currently ongoing in any domain and rated its stressfulness on a scale from 1 (*not at all stressful*) to 7 (*extremely stressful*). Participants wrote about a variety of stressors, including academic or career-related stressors (e.g., choosing a major; taking difficult classes; 51.2%), romantic relationship stressors (e.g., breaking up with a boyfriend; 20.2%), family relationship stressors (e.g., fight with parents; 15.5%), stressors related to friends (e.g., missing friends back home; 8.3%), and other stressors (e.g., living with a chronic illness, being homeless; 4.8%). On the seven-point scale, participants rated their experience as very stressful (M = 5.78, SD = .95, range = 4–7).

After participants completed questionnaires, a trained research assistant placed three electrocardiogram (ECG) electrodes in a modified Lead II configuration to assess HR. After completing a baseline mood rating, participants rested quietly with their eyes open for a 5-min period to establish a physiological baseline. They were then randomized to one of three writing conditions. Writing instructions were provided both in written form and via audiotape, and experimenters remained unaware of experimental condition.

The three writing tasks to which participants were randomized involved: (1) evaluating their emotional response to the situation, explicitly considering whether emotions were appropriate or may have gotten in the way of managing the stressor effectively (EVAL; n = 26), (2) attending to their emotional response, including physical sensations and thoughts, in a positively valenced, accepting way and allowing their experience to unfold without negative evaluation (ACC; n = 25), or (3) attending to the objective details surrounding the stressful situation (CTL; n = 30). Participants wrote for 10 minutes in each of two sessions. Writing instructions for the three conditions were constructed by the authors, with instructions for persistence in writing (e.g., "write continuously") and the control condition adapted from Pennebaker and Beall (1986):

> EVAL: What I would like you to write about is your judgment of your emotional response to the stressful situation you are thinking about. Remember that emotions can sometimes get in the way of thinking clearly and responding appropriately. First you may want to briefly describe what your emotional response has been. Then notice whether you like or dislike feeling this way. Consider whether these feelings are an appropriate response to the stressor you are experiencing and whether these emotions get in the way of anything. What I am interested in is your judgment and opinion of this emotional response. The only rule we have is that you write continuously for the entire time. If you run out of things to say, just repeat what you have already written. Don't worry about grammar, spelling, or sentence structure. Don't worry about erasing or crossing things out. As you consider the appropriateness of your thoughts and feelings, just keep writing. . .
>
> ACC: What I would like you to write about is your emotional response to the stressful situation you are thinking about. Remember

that emotions are normal, healthy, and temporary reactions that add richness to experiences and serve as a cue as to what is important to you in life. Just write whatever you are experiencing without judgment or evaluation. You might describe your emotion as thoughts that are passing through your mind or bodily sensations such as tension or racing heart. Whatever you are feeling, allow that this is your emotional experience right now. What I am interested in is your open and nonjudgmental awareness of this emotional response. The only rule. . . [remainder identical to other conditions]

CTL: What I would like you to write about is a detailed, factual account of the stressful situation you are thinking about. You might want to describe in objective detail the stressor, including dates, the names of places or people associated with the event, or other minor facts. No fact is too big or small. We realize that you may have strong emotions associated with this situation, but in your writing we want you to focus only on the objective facts, not your response. What I am interested in is an objective, detailed account of the stressful experience. The only rule. . . [remainder identical to other conditions]

After the 10-min writing session, participants completed a second mood rating and then rested quietly for a 5-min recovery period.

Participants returned for a second writing session one week later which was identical to the first. Experimental condition, writing instructions, and mood ratings remained the same, and HR was assessed continuously. Following the second recovery period, participants were debriefed and offered compensation for their participation (course credit or $20).

Measures

HR. ECG was measured continuously at a sampling rate of 1000 Hz using the software program Acqknowledge (MP35 hardware, Biopac Systems, Goleta, CA). HR was estimated from ECG R-R intervals every 10 seconds and subsequently averaged for each segment (i.e., 5-min baseline, 10-min writing period, and 5-min postwriting period).

Self-reported mood. Immediately prior to and after each writing period, participants completed the "right now" version of the Positive and Negative Affect Schedule (Watson & Clark, 1994). The scale contained affect adjectives rated on a 5-point scale (1 = *not at all*, 5 = *extremely*), including 10 items assessing positive affect ($\alpha = .84$) and 10 items assessing negative affect ($\alpha = .87$).

Linguistic content analysis. All essays were analyzed with the computerized text analysis program, Linguistic Inquiry and Word Count program (LIWC) (Pennebaker, Booth, & Francis, 2006). The LIWC program searches text files and computes the percentage of words judged to reflect high-level content categories. The relevant LIWC content categories were positive emotion words (e.g., happy, joy) and negative emotion words (e.g., angry, cried). Percentage scores for each text category were computed for each writing session.

Data Reduction and Analyses

We first computed change scores for the primary dependent variables by subtracting the average baseline value from the variable of interest. These included changes in mood (postwriting mood minus prewriting mood), HR reactivity (mean HR during writing minus mean HR during baseline), and HR recovery (mean HR during postwriting recovery period minus mean HR during baseline; e.g., Glynn et al., 2002; Steptoe & Marmot, 2006). As recommended by Llabre, Spitzer, Saab, Ironson, and Schneiderman (1991), raw change scores rather than residualized change scores were used.[1]

Analysis of variance (ANOVA) was conducted to determine whether changes in mood, HR reactivity, and HR recovery differed as a function of experimental group assignment. When ANOVAs were statistically significant, post hoc pairwise *t* tests were conducted to identify the locus of the effect. Because we were specifically interested in habituation across repeated exposure to stressors and because similar studies have demonstrated that the effects of different forms of processing may not emerge until the second experimental session (Mendolia & Kleck, 1993; Stanton et al., 2000, Study 4), separate analyses were conducted for each session, and habituation was defined as reduced reactivity to the second experimental session.

To select potential covariates, we examined the relationship between potential confounds (i.e., age, ethnicity, and gender) and dependent variables (i.e., HR reactivity and recovery) after ensuring that the demographic variables did not interact with experimental condition. Correlations for age and ANOVA for ethnicity and gender revealed no significant association of age, ethnicity, or gender with dependent variables (all $ps > .08$). Thus, no demographic covariates were included in analyses.

Results

Baseline Descriptive Statistics

During Session 1, the mean baseline HR was 76.46 beats per minute ($SD = 10.61$), mean reported level of positive affect was 27.25 (reflecting that participants felt each of 10 positive emotions "*a little*" to "*moderately*"; $SD = 7.03$), and mean reported level of negative affect was 16.78 (reflecting that participants felt each of 10 negative emotions "*very slightly*" to "*a little*"; $SD = 6.38$). Baseline mood was comparable to published norms for undergraduates (29.0 for positive affect and 15.8 for negative affect; Watson & Clark, 1994). There were no significant differences between experimental conditions on any baseline measure (all $ps > .21$).

Manipulation Check

An independent rater read all pairs of essays in random order and recorded which condition instructions they most reflected. The rater correctly classified 95% of the participants, indicating excellent adherence to writing instructions.

Effect of Experimental Condition on Heart Rate

Across groups, participants demonstrated increased HR during writing and recovery relative to baseline. Paired-sample *t* tests revealed that baseline HR was significantly greater during Session 2, $t(78) = -3.01$, $p < .01$, and HR reactivity and recovery were both significantly lower in Session 2, $t(78) = 2.39$, $p < .05$; $t(78) = 2.85$, $p < .01$, respectively.

[1] Identical results were obtained by conducting analyses of covariance on writing and recovery HR and post-writing mood, including baseline values as a covariate and group as a fixed factor.

We predicted that the three experimental groups would differ with regard to HR reactivity and recovery, with the ACC group demonstrating faster HR recovery after both sessions as well as less reactivity to the writing task during Session 2. Although means were in the expected direction, there was no effect of experimental condition on HR recovery during Session 1. However, ANOVA revealed significant group differences in HR recovery during Session 2, $F(2, 78) = 6.62$, $p < .001$, $\eta^2 = .15$. In post hoc analyses, the EVAL group demonstrated slower HR recovery during Session 2 relative to both the ACC, $t(49) = -3.26$, $p < .01$, and CTL group, $t(54) = -1.95$, $p < .05$, which did not differ. ANOVA also indicated a significant effect of experimental condition on HR reactivity during Session 2, $F(2, 78) = 3.02$, $p < .05$, $\eta^2 = .07$. Participants in the EVAL group displayed greater increases in HR than the ACC group, $t(49) = -2.70$, $p < .01$, although neither experimental group differed significantly from CTL. The effect of experimental condition on Session 2 recovery remained significant in analysis of covariance (ANCOVA) controlling for Session 2 HR reactivity, $F(2, 77) = 3.67$, $p < .05$, $\eta^2 = .09$, suggesting that group differences in recovery were not fully accounted for by group differences in reactivity. Thus, results suggest that the EVAL condition demonstrated slower HR recovery and less habituation than the ACC condition, but ACC participants did not differ significantly from the CTL group. Group means are presented in Table 1.

Effect of Experimental Condition on Changes in Mood

Across groups, participants' reported positive affect decreased after writing, while negative affect increased. In examining differences in mood changes from Session 1 to Session 2, we found evidence that the increase in negative affect was significantly smaller in Session 2, $t(79) = 2.10$, $p < .05$, consistent with habituation of emotional reactivity over time.

We hypothesized that the ACC group would report more positive and less negative mood reactivity, compared to participants in the EVAL condition. Contrary to hypotheses, ANOVA revealed no significant effect of experimental condition on positive affect change [Session 1: $F(2, 78) = 1.08$, $p = .34$, $\eta^2 = .03$; Session 2: $F(2, 77) = .25$, $p = .78$, $\eta^2 = .01$] or negative affect change [Session 1: $F(2, 78) = 1.08$, $p = .35$, $\eta^2 = .03$; Session 2: $F(2, 77) = .30$, $p = .74$; $\eta^2 = .01$]. Group means by session are presented in Table 2.

Effect of Experimental Condition on Linguistic Content

We predicted that the ACC group would use more positive and fewer negative words than the EVAL group. Groups differed significantly in their use of negative emotion words (including words connoting anxiety, anger, and sadness) across both sessions [Session 1: $F(2, 78) = 19.25$, $p < .001$, $\eta^2 = .33$; Session 2: $F(2, 78) = 22.71$, $p < .001$, $\eta^2 = .37$]. Post hoc pairwise comparisons revealed that the CTL group used fewer negative emotion words than both the ACC and the EVAL group across both sessions (all ps $< .001$). Contrary to hypotheses, the percentage of negative words used by the ACC group did not significantly differ from the EVAL group, although there was a trend in the hypothesized direction for Session 2 only, $t(49) = -1.73$, $p < .10$. Also contrary to hypotheses, group differences in positive emotion word use were not statistically significant for either session [Session 1: $F(2, 78) = 2.74$, $p = .07$, $\eta^2 = .07$; Session 2: $F(2, 78) = 2.36$, $p = .10$, $\eta^2 = .06$]. Thus, results provided very limited support for hypotheses that the ACC group would use more positive and fewer negative emotion words in essays than the EVAL group.

Associations Between Essay Content, Mood, and HR Reactivity and Recovery

Finally, we examined whether there were associations between the observed group differences in HR reactivity and recovery, linguistic qualities of the essays, and changes in self-reported mood. We conducted ANCOVAs on Session 2 HR reactivity and recovery, including group as a fixed factor and either essay content (i.e., percentage positive or negative emotion words in Session 2 essays) or self-reported mood (i.e., changes in positive affect or negative affect during Session 2) as covariates. No significant relationships emerged between HR variables and either essay content or mood (all ps $> .08$). Thus, there was no indication that emotional reactivity or essay content mediated the observed group differences in HR reactivity and recovery.

Table 1
Mean Heart Rate, Heart Rate Reactivity, and Heart Rate Recovery

	ACC	EVAL	CTL	
Session 1 Baseline HR	77.15 (1.95)	74.62 (1.80)	77.46 (2.34)	$F(2, 76) = .55$, *ns*, $\eta^2 = .01$
Session 1 Writing HR	81.10 (1.91)	82.35 (2.59)	82.42 (2.62)	$F(2, 76) = .09$, *ns*, $\eta^2 = .00$
Session 1 Postwriting HR	80.69 (2.46)	79.76 (2.53)	81.55 (2.50)	$F(2, 76) = .13$, *ns*, $\eta^2 = .00$
Session 1 HR Reactivity	3.95 (.95)	7.73 (2.36)	4.96 (1.17)	$F(2, 79) = 1.46$, *ns*, $\eta^2 = .04$
Session 1 HR Recovery	3.53 (1.71)	5.14 (2.30)	4.09 (1.64)	$F(2, 76) = .18$, *ns*, $\eta^2 = .01$
Session 2 Baseline HR	82.78 (2.30)	77.98 (2.60)	79.57 (2.18)	$F(2, 78) = 1.02$, *ns*, $\eta^2 = .03$
Session 2 Writing HR	83.09 (2.03)	82.89 (2.76)	82.16 (2.01)	$F(2, 78) = .05$, *ns*, $\eta^2 = .00$
Session 2 Postwriting HR	80.92 (1.91)	81.49 (2.70)	80.26 (2.02)	$F(2, 78) = .08$, *ns*, $\eta^2 = .00$
Session 2 HR Reactivity	$.32_{a}$ (.65)	4.91_{b} (1.55)	2.59_{ab} (1.38)	$F(2, 78) = 3.02$, $p < .05$, $\eta^2 = .07$
Session 2 HR Recovery	-1.86_{a} (1.00)	3.51_{b} (1.30)	$.70_{a}$ (.74)	$F(2, 78) = 6.62$, $p < .001$, $\eta^2 = .15$

Note. ACC = attended to emotion in an accepting way; EVAL = evaluated appropriateness of emotional response; CTL = described objective details of the experience; *ns* = not significant; HR = heart rate; HR Reactivity = Writing HR – Baseline HR; HR Recovery = Postwriting HR – Baseline HR. *SE*s are in parentheses. Means with different subscripts differ significantly at $p < .05$.

Table 2
Mean Self-Reported Affect Before and After Writing

	ACC				EVAL				CTL			
	Session 1		Session 2		Session 1		Session 2		Session 1		Session 2	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Positive affect	27.04 (1.24)	22.64 (1.44)	23.12 (1.90)	20.88 (2.03)	28.04 (1.57)	24.58 (2.04)	25.50 (1.75)	23.23 (2.08)	26.73 (1.26)	24.47 (1.64)	25.59 (1.57)	22.48 (1.62)
Negative affect	16.28 (1.44)	20.80 (1.73)	16.44 (1.24)	18.56 (1.27)	17.35 (1.06)	23.04 (1.81)	17.23 (1.26)	20.54 (1.82)	16.70 (1.20)	19.60 (1.29)	14.48 (1.01)	17.55 (1.04)

Note. ACC = attended to emotion in an accepting way; EVAL = evaluated appropriateness of emotional response; CTL = described objective details of the experience. *SE*s are in parentheses.

Discussion

The primary goal of this study was to examine effects of accepting versus evaluative emotional processing on cardiovascular habituation and recovery. Results suggest that evaluating one's emotional response impairs heart rate recovery, relative to both the acceptance and the control group. The evaluative writing task also seemed to inhibit HR habituation to repeated emotional processing, as participants in the evaluative writing condition demonstrated greater HR reactivity during the second experimental session relative to those writing about their emotions in accepting way. Acceptance-oriented emotional processing produced HR responses that did not differ from the control condition, which involved focusing on the facts of the stressor. Thus, rather than indicating that attending to emotions in an accepting way is beneficial, results provide more support for the notion that negatively evaluating one's emotional response may be detrimental to physiological adjustment. These findings are consistent with previous theoretical and empirical work on the pernicious effects of evaluative brooding about emotions (Hayes et al., 1999; Rude et al., 2007).

Contrary to hypotheses, the observed group differences in HR responses were not accompanied by differences in self-reported positive or negative emotion reactivity to the writing task or by differences in the linguistic content of the essays. Given that the experimental effect was stronger for physiological recovery than reactivity, it is possible that despite the lack of group difference in mood reactivity, the acceptance group would exhibit better emotional recovery than the evaluation group (i.e., decrease in induced negative mood following the recovery period). Unfortunately, self-reported mood was not assessed after the recovery period in the current study, so this hypothesis must be tested in future investigations.

It is interesting to note that differences in HR between the evaluative and acceptance-oriented emotional processing groups emerged only in Session 2. The delayed effect on HR reactivity may reflect the hypothesized difference in habituation facilitated by nonjudgmental attention to emotions; however, differences in recovery were expected across both sessions. One potential explanation for this pattern of results is that the effects of different styles of emotional processing on the response trajectory may become more evident over time and with repeated exposure. These findings are consistent with other data demonstrating that emotional expression about a stressor affects reactivity to and recovery from exposure to the same stimulus at a later time (Mendolia & Kleck, 1993; Stanton et al., 2000, Study 4). Future studies including more than two repeated exposures to the writing task might better elucidate group differences in habituation and recovery, especially since HR was elevated during Session 2 baseline for all groups (perhaps reflecting anticipatory anxiety about confronting the stressor the second time), potentially limiting our ability to examine habituation and recovery processes.

Several limitations must be noted. First, the sample consisted of undergraduate students who reported that they were experiencing an ongoing stressor, and results may not generalize to older, chronically stressed, or clinical samples. Second, although participants wrote about naturalistic life stressors, the benefits of emotional acceptance may not extend to emotional processing that occurs outside of the laboratory or to merely thinking (and not writing) about emotions (Lyubomirsky, Sousa, & Dickerhoof, 2006). Third, alternative explanations for the results cannot be dismissed,

as multiple factors may influence HR. For example, if the instructions differed in the level of cognitive demand required (which was not measured), cognitive effort may have influenced HR responses.

In conclusion, the current findings suggest that processing emotions in an evaluative way may impair physiological recovery and habituation, prolonging HR reactivity and producing persistently high HR increases across repeated exposures. To further elucidate the effect of evaluative processing on the stress response trajectory, future studies should use more refined physiological measures, (e.g., preejection period and respiratory sinus arrhythmia to disentangle potential sympathetic and parasympathetic contributions; cardiac output and total peripheral resistance to explore vascular vs. myocardial mechanisms), test whether recovery or habituation of mood reactivity is also impaired by evaluative processing, and examine potential moderators of experimental effects (e.g., emotional evaluation may be more pernicious for certain individuals, specific emotions, or regarding certain kinds of stressors; Stanton et al., 2000). The current study highlights a potential mechanism of mindfulness- and acceptance-based interventions' effects on health outcomes, where these interventions may facilitate cardiovascular habituation and recovery by teaching individuals to avoid negatively evaluating emotions (Carlson et al., 2003; Davidson et al., 2004). Findings also suggest that habitually evaluating the appropriateness of one's emotional responses rather than accepting them as they unfold may have consequences for cardiovascular health. Although these preliminary results are intriguing, the clinical significance of the observed HR differences remains unclear. Future research could address these issues by examining associations between evaluative emotional processing, HR habituation and recovery processes, and more proximal measures of morbidity (e.g., inflammatory markers).

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Received May 17, 2007
Revision received February 12, 2008
Accepted February 19, 2008 ■