How to Bite Your Tongue Without Blowing Your Top: Implicit Evaluation of Emotion Regulation Predicts Affective Responding to Anger Provocation

Iris B. Mauss
Stanford University

Catharine Evers
University of Amsterdam

Frank H. Wilhelm
University of Basel

James J. Gross
Stanford University

People frequently have to control their emotions to function in life. However, mounting evidence suggests that deliberate emotion regulation often is costly. This presents a dilemma: Is it better to let emotions go or to pay the price of exerting costly control? In two studies, the authors explore whether emotion regulatory processes associated with implicit positive evaluation of emotion regulation might provide the benefits of successful emotion regulation without the costs. In Study 1, the authors introduce a measure of implicit evaluation of emotion regulation (ER-IAT). Study 2 examined whether this measure is associated with actual emotional responses to an anger provocation. It was found that greater ER-IAT scores were associated with lesser anger experience, fewer negative thoughts, lessened self-reported effortful emotion regulation, and an adaptive pattern of cardiovascular responding. These findings suggest that implicit positive evaluation of emotion regulation is associated with successful, automatic, and physiologically adaptive down-regulation of anger.

Keywords: *implicit evaluation; IAT; automatic emotion regulation; anger; experience; physiological responding*

> Anger is momentary madness, so control your passion or it will control you.
>
> —Horace

Telling off an annoying coworker or snapping at an overbearing relative may feel good in the moment. However, angry outbursts often have adverse consequences, and successful emotion down-regulation is widely regarded as crucial for psychological and social functioning (e.g., Baumeister & Exline, 2000; Salovey, Hsee, & Mayer, 1993; Tavris, 1984).[1] The problem is that many forms of emotion regulation seem to have costs of their own, including impaired cognitive performance (e.g., Bonanno, Papa, Lalande, Westphal, & Coifman, 2004; Richards & Gross, 1999), disrupted social interactions (e.g., Butler et al., 2003), little or no subjective relief from negative emotion (e.g., Gross & Levenson, 1997; Martin & Watson, 1997), and maladaptive physiological

Authors' Note: This research was supported by National Institutes of Health Grant MH58147 and by Swiss National Science Foundation Grant 105311-105850. The authors would like to thank Alana Conner Snibbe, Boris Egloff, Maya Tamir, Robert Zajonc, and members of the Stanford Psychophysiology Laboratory for their help with this research. Correspondence concerning this article should be addressed to Iris Mauss, Department of Psychology, Stanford University, Stanford, CA 94305-2130; e-mail: iris@psych.stanford.edu.

PSPB, Vol. 32 No. 5, May 2006 1-14
DOI: 10.1177/0146167205283841

responding (e.g., Dembroski, MacDougall, Williams, Haney, & Blumenthal, 1985; Gross & Levenson, 1997).

Is there any way around this damned-if-you-do and damned-if-you-don't dilemma of emotion regulation? One answer might be that different emotion regulation strategies have different profiles of consequences (e.g., Gross, 1998). Previous studies typically have focused on deliberate, response-focused emotion regulation, as predicted by participants' explicit reports of emotion regulation strategies. Their costs may arise from the conscious effort involved in suppressing emotion-related responses (e.g., Muraven, Tice, & Baumeister, 1998; Wegner, 1994). Because effort may underlie deliberate regulation's costs, automatic and presumably effortless emotion regulation (e.g., regulation associated with implicitly held beliefs, habits, or culturally transmitted norms) might solve the dilemma of emotion regulation. In the present report, we consider the possibility that less deliberate (and more automatic) emotion regulatory processes—those associated with individuals' positive implicit attitudes toward emotion regulation—may be effective at down-regulating emotion and yet avoid the costs often associated with deliberate emotion regulation (see Note 1).

The core idea that animates the present report is that automatic emotion regulatory processes might allow one to successfully regulate anger without the costs of effortful emotion regulation. To set the stage for our studies, we first review prior findings regarding automatic emotion regulation, highlighting limitations of prior studies that make it difficult to come to firm conclusions about the consequences of automatic emotion regulatory processes. We argue that one promising avenue to gain more insight into such processes is to measure individuals' implicit evaluation of emotion regulation. Next, we present Study 1, in which we introduce a novel measure of implicit evaluation of emotion regulation. Then, we present Study 2, in which we test whether our measure of implicit evaluation of emotion regulation is associated with actual emotional responses to a laboratory anger provocation. Results from Study 2 raise the intriguing possibility that implicit positive evaluation of emotion regulation is associated with effective reduction of feelings of anger and angry thoughts but is not accompanied by greater self-reported effortful control of emotion or the physiological cost of maladaptive cardiovascular activation.

Automatic Processes in Emotion Regulation

Research on automaticity (e.g., Bargh, 1994) and on emotion regulation (e.g., R. J. Davidson, Jackson, & Kalin, 2000; Gross, 1998; Thompson, 1994) are both areas of research that are fraught with conceptual complexities (e.g., Cole, Martin, & Dennis, 2004; Gross, 1998). Merging these two complex bodies of research makes it essential to clarify the terms we use. We use the term "emotion regulation" to refer to the modulation of any aspect of an emotional response, including experience and expressive behavior (cf. Eisenberg & Spinrad, 2004; Goldsmith & Davidson, 2004; Gross, 1998; Gross & John, 2003). Automatic processes in emotion regulation encompass two types of processes: first, implicitly (largely unconsciously) represented ideas that individuals have about emotion regulation, and second, automatic (largely unconscious and effortless) emotion regulation that individuals engage in during emotional situations (cf. Bargh & Chartrand, 2000; Bargh, Gollwitzer, Lee-Chai, Barndollar, & Troetschel, 2001). In the present article, we refer to the first concept as "implicit evaluation of emotion regulation" and to the second concept as "automatic emotion regulation." When we refer to both concepts together, we use the term "automatic processes in emotion regulation."

The following literature review illustrates that research on automatic processes in emotion regulation has been hampered by two difficulties. First, it has been extremely difficult to measure implicit evaluation of emotion regulation, and second, by definition, it is impossible to directly measure automatic emotion regulation. The present article attempts to further our knowledge about automatic processes in emotion regulation by providing a novel measure of implicit evaluation of emotion regulation. Because it cannot be presumed that implicit positive evaluation of emotion regulation translates into actual automatic emotion regulation, we then empirically test whether this measure predicts actual responding to an emotional situation.

Automatic Emotion Regulation: Costly or Cost-Free?

One literature that speaks against the possibility that automatic emotion regulatory processes might be "cost free" is the literature on repression. As formulated by Freud, repression is a form of automatic emotion regulation that is motivated by the individual's need to remain unaware of emotions that are intolerably painful or incompatible with the ideal self (Freud, 1930/1961). Several individual difference measures of repression have been developed (Byrne, Golightly, & Sheffield, 1965; Erdelyi, 2001; Paulhus, Fridhandler, & Hayes, 1997; Weinberger, 1995), and laboratory studies show that repression is associated with impaired cognitive and social skills, as well as with greater physiological reactivity (e.g., Asendorpf & Scherer, 1983; Brosschot & Janssen, 1998; Schwartz, 1995; Weinberger, 1995). Two important limitations to this literature, however, are that existing measures that tap automatic emotion regulation and related constructs (e.g., repression, denial, defensiveness, or

alexithymia) (a) often rely on explicit self-reports, which might be inappropriate to assess automatic processes (e.g., in the case of alexithymia) (Bagby, Parker, & Taylor, 1994), and (b) often assess constructs quite distal from emotion regulation (e.g., in the case of repression, or repressive coping, a combination of high social desirability and low self-reported trait anxiety) (cf. Holmes, 1990). These factors raise doubts about whether existing measures are the best (or only) way to predict automatic emotion regulation.

In contrast to the literature on repressive coping, recent research on automaticity is more supportive of the notion that automatic emotion regulation may operate at little cost. These studies have shown that complex judgments, social behaviors, and even the pursuit of higher-level goals (e.g., to cooperate in a competitive game) can be executed automatically (e.g., Bargh et al., 2001; Bodenhausen, Macrae, & Hugenberg, 2003; Kihlstrom, 1987). Such automatic goal pursuit can occur without subjective awareness and thereby may consume little or no attentional capacity or subjective effort (Bargh et al., 2001; Chartrand & Jefferis, 2003; Fitzsimons & Bargh, 2004; Koole & Jostmann, 2004). If automatic emotion regulation operates in a similar fashion, one would likewise expect it to be effective for controlling feelings and behaviors and to occur with little or no psychological and physiological cost. Moreover, automatic processes presumably are activated quickly and operate efficiently (Bargh, 1994; Kihlstrom, 1987; Wilson & Schooler, 1991); automatic emotion regulation might thus effectively interrupt the development of an emotional impulse before it unfolds, a sequencing that has been shown to be beneficial for experiential and physiological responses (Gross, 1998).

One empirical study of automatic emotion regulation that addresses prior limitations was conducted by Jackson and colleagues (2003). In this study, participants' resting prefrontal cortex (PFC) EEG activity was measured, which was hypothesized to be a marker of individual differences in emotion regulation. Participants then saw emotional pictures while their eyeblink startle amplitude was recorded. As predicted, PFC EEG asymmetry was associated with smaller emotion-modulated startle, which the authors interpreted as indicating successful automatic regulation. These findings are important but also raise a number of questions. First, PFC activation, although arguably associated with emotion regulation (e.g., Ochsner et al., 2004), is also related to a number of other processes, including working memory and cognitive control (e.g., Miller & Cohen, 2001), and thus might not be specific enough to assess automatic emotion regulation. Second, the study does not provide a measure of deliberate emotion control. Although the context (participants viewing slides without regulatory instructions) was conducive to automatic emotion regulation, it is difficult to know the extent to which participants used automatic (relative to deliberate) regulatory processes. Third, some key affective responses (e.g., emotion experience, behavior) were not measured, so the effect of regulatory processes on these affective responses is unknown.

The Present Research

The two literatures outlined above draw into sharp relief how little is known about automatic processes in emotion regulation. In the present studies, we sought to address two key questions. First, how can individual differences in automatic emotion regulation be predicted? Second, what are the affective correlates of such processes? In Study 1, we begin with the idea that positive versus negative implicit evaluation of emotion regulation potentially might provide a proxy for automatic emotion regulation. Based on this logic, we employ a variant of the Implicit Association Test (IAT) (Greenwald, McGhee, & Schwartz, 1998), a reaction time task that indirectly measures implicit evaluation of categories. We dub our IAT variant the Emotion Regulation–IAT (ER-IAT), and in Study 1, we examine this measure's reliability and validity. In Study 2, we assess the relationship between the ER-IAT and experiential, behavioral, and cardiovascular responding to an anger provocation. The goal of Study 2 was to establish whether the ER-IAT measures would be associated with actual affective responding to an anger provocation and, if so, to examine whether these responses would be consistent with effective, automatic, and physiologically adaptive emotion regulation.

STUDY 1: ASSESSING INDIVIDUAL DIFFERENCES IN IMPLICIT EVALUATION OF EMOTION REGULATION

Because automatic emotion regulation is a process that is, by definition, executed outside of participants' awareness, it is impossible to assess it with traditionally used self-reports. How then could we predict the use of automatic emotion regulation? Our approach was based on the notion that the automatic goal to regulate emotion might be represented as implicit positive evaluation of emotion regulation (e.g., Aarts & Dijksterhuis, 2000, 2003). To assess individual differences in implicit evaluation of emotion regulation, we adapted the IAT (Greenwald et al., 1998). Although there is ongoing debate about exactly what the IAT measures (e.g., task switching ability, category salience, category familiarity, or knowledge about cultural stereotypes) (cf. Brendl, Markman, & Messner, 2001; Mierke & Klauer, 2003; Rothermund & Wentura, 2004), most research suggests that IAT scores provide an estimate of the strength of as-

sociation between categories (Banse, Seise, & Zerbes, 2001; Dasgupta, McGhee, Greenwald, & Banaji, 2000; Fazio & Olson, 2003). A stronger association between emotion regulation and positive relative to negative items thus implies implicit positive evaluation of emotion regulation.

The IAT seemed a reasonable candidate for assessing individual differences in implicit evaluation of emotion regulation for four reasons. Since its introduction (Greenwald et al., 1998), the IAT has been shown to validly measure implicit evaluations in a number of contexts, including prejudice toward social groups, speech anxiety, or self-esteem (e.g., Egloff & Schmukle, 2002; Greenwald & Farnham, 2000; Karpinski, 2004). In these and other contexts, the IAT has shown resistance to self-presentational concerns and lack of dependence on introspective access (Banse et al., 2001), rendering it a promising candidate to assess implicit, largely unconscious processes. Second, the IAT has good psychometric properties, including adequate stability across time (e.g., Greenwald et al., 1998; Greenwald & Farnham, 2000; but see Blair, 2002; Dasgupta & Asgari, 2004, for situational influences on IAT scores). Third, the IAT is based on semantic material that is presented supraconsciously, meaning that the IAT can be tailored to a specific and abstract concept such as emotion regulation. Fourth, the implicit evaluations assessed with the IAT have been validated with non-self-report measures such as brain activation or behaviors, suggesting that IAT scores relate meaningfully to psychological and behavioral processes over and above mere evaluation of its target categories. For example, Phelps and colleagues found that IAT scores indexing racial bias were associated with amygdala activation in response to racial pictures, indicating stronger emotional responding (e.g., Phelps et al., 2000). In terms of behaviors, implicit associations between social groups (e.g., racial groups) and negative words predicted prejudice-related behaviors toward members of these groups (e.g., McConnell & Leibold, 2001; for a review, see Fazio & Olson, 2003).

These findings suggest that the evaluation of categories assessed by IAT scores can translate into behaviors and self-regulatory processes. However, despite the success of IAT measures in other domains, it has not been applied to the study of emotion regulation. The goal of Study 1 was to develop a variant of the IAT appropriate to assessing individual differences in implicit evaluation of emotion regulation. Our expectation was that the ER-IAT would have adequate reliability, convergent validity, and discriminant validity. Specifically, we expected it to have modest associations with explicit evaluation of emotion regulation, trait emotion expression, and trait emotion regulation (as one would not expect a perfect dissociation of automatic vs. deliberate emotion regulation) and would have no associations with explicit measures of trait emotion experience or explicit measures of automatic emotion regulation.

TABLE 1: Items Used in the Emotion Regulation–Implicit Association Test (ER-IAT)

Emotion Regulation	*Emotion Expression*	*Positive*	*Negative*
Controlled	Expressive	Pleasant	Negative
Cool	Emotional	Good	Bad
Hide	Reveal	Gold	Gloom
Contain	Disclose	Honor	Filth
Suppress	Discharge	Lucky	Rotten

METHOD

Participants and Procedure

Two hundred and forty-five college students (88% women) completed the Emotion Regulation–IAT (ER-IAT) in individual sessions. The ethnic composition of the sample was mixed: 2% African American, 5% Asian American, 76% Caucasian American, 7% Latino American, and 11% with other or multiple ethnic identities. Afterward, participants completed paper-and-pencil personality measures.[2] Because of time constraints, not all measures were administered to all participants (all *N*s are >151). To assess test-retest reliability, 36 of the participants completed the ER-IAT a second time 3 months later.

Measures

ER-IAT. The ER-IAT was adapted from the IAT (Greenwald et al., 1998). Participants were told that they should respond as rapidly as possible in categorizing each stimulus word but not so fast as to make many errors. The task was administered on a PC laptop with the program Inquisit for Windows XP. Items from the categories emotion regulation, emotion expression, positive, and negative were presented (see Table 1 for a list of all items). The ER-IAT comprised five blocks. Blocks 1, 2, and 4 consisted of practice trials (20 each). In the critical Block 3, participants categorized items into two combined categories, namely, emotion regulation and positive items versus emotion expression and negative items (20 practice and 40 critical trials). In the second critical Block 5, participants again categorized items into two combined categories with switched key assignments, namely, emotion expression and positive items versus emotion regulation and negative items (20 practice and 40 critical trials).[3] If participants gave an incorrect answer at first, the program waited for the correct answer, leading to a built-in error penalty. IAT reaction time data

TABLE 2: Study 1: Pearson's Correlations Between ER-IAT Scores and Explicit Measures of Trait Emotion Experience, Expression, Regulation, and Constructs Related to Automatic Emotion Regulation

	Measure	r	N
Trait emotion experience	Anger (STAXI)	.07	231
	Anxiety (STAI)	.02	151
	Depression (BDI)	.05	165
Explicit evaluation	Valuing emotion regulation	.21***	241
Trait emotion expression	Positive emotion expressivity (BEQ-PEX)	–.15*	243
	Negative emotion expressivity (BEQ-NEX)	–16**	243
Trait emotion regulation	Deliberate suppression (ERQ-Suppression)	.16**	243
Related constructs	Identifying emotions (TAS)	.08	166
	Communicating emotions (TAS)	.12	166
	Defensiveness (MC)	.07	236
	Repression (high MC/low STAI)	$t = 1.42$[a]	151

NOTE: ER-IAT = Emotion Regulation–Implicit Association Test, BDI = Beck Depression Inventory, BEQ-PEX = Berkeley Emotion Expressivity positive, BEQ-NEX = negative emotion expressivity scales, ERQ = Emotion Regulation Questionnaire, TAS = Toronto Alexithymia Scale, MC = Marlowe Crowne Scale.

a. Result from groupwise *t* test comparing ER-IAT scores of nonrepressors (*M* ER-IAT = –.35, *SD* = .41, *n* = 120) with ER-IAT scores of repressors (–.20, .55, 31).

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

were scored following Greenwald, Nosek, and Banaji (2003) using the algorithm that showed the greatest validity, stability, and resistance against artifacts ("D") (see also Mierke & Klauer, 2003). Data from practice as well as test trials were used. First, trials with latencies greater than 10,000 ms were deleted. Then, to adjust for variability of latencies, *SD*s across practice and test trials were computed for each respondent. Average latencies of practice and test trials were divided by the resulting *SD*s. Final IAT scores were calculated by subtracting averages from Block 3 from averages from Block 5. Higher ER-IAT scores thus indicate more positive implicit evaluation of emotion regulation relative to emotion expression.

Explicit measures. To assess convergent and discriminant validity of the ER-IAT, we measured explicit trait emotion experience, evaluation of emotion regulation, emotion expression, emotion regulation, and automatic emotion regulation. Trait emotion experience was measured with the STAXI-Trait Anger Experience (Spielberger & Sydeman, 1994), the STAI-Trait Anxiety Experience (Spielberger & Sydeman, 1994), and the Beck Depression Inventory (BDI) (Beck & Steer, 1984). Explicit evaluation of emotion regulation (Valuing Emotion Regulation) was assessed with a six-item measure developed for this research (e.g., "It is better for people to let out pent-up emotions" [$\alpha = .74$]). Trait emotion expression was assessed with the Berkeley Emotion Expressivity positive (BEQ-PEX) and negative emotion expressivity scales (BEQ-NEX) (Gross & John, 1997). Trait emotion regulation was assessed with the Emotion Regulation Questionnaire (ERQ) (Gross & John, 2003), which measures how much individuals regulate their emotions using deliberate suppression. To assess constructs that have in the past been related to automatic emotion regulation, we used the Toronto Alexithymia Scale to measure participants' self-reported ability to identify and communicate emotions (TAS-ID and TAS-COM) (Bagby et al., 1994) and the Marlowe Crowne Scale to measure defensiveness (MC) (Crowne & Marlowe, 1960). We also created a dichotomous repression indicator by identifying participants with MC scores greater than the median and STAI scores lesser than the median (Weinberger, 1995).

RESULTS AND DISCUSSION

Reliability

To compute internal consistency, we subtracted each Block 3 trial's response latency from the corresponding Block 5 trial's response latency. Cronbach's alpha across the resulting 60 items was .86. The test-retest reliability of the ER-IAT was adequate: $r = .68$ ($p < .001$, $N = 36$) across an interval of 3 months.

Convergent and Discriminant Validity

As Table 2 indicates, ER-IAT scores were negatively correlated with explicit trait positive emotion expression and negative emotion expression, positively correlated with explicit evaluation of emotion regulation, and positively correlated with suppression. The small correlations suggest convergent validity with explicit valuing of emotion regulation and explicit trait measures of emotion expression and deliberate suppression but indicate that the ER-IAT is by no means redundant with these measures. ER-IAT scores were not associated with trait

measures of emotion experience, identifying emotions, communicating emotions, defensiveness, or repression (all *p*s > .11), suggesting discriminant validity of the ER-IAT scores from emotion experience and prior measures of automatic regulation. Together, these findings indicate that the ER-IAT is associated with explicit evaluation of emotion regulation as well as with explicit trait expressivity and regulation and that it assesses trait regulation rather than trait experience of emotion. These correlations, although significant, are small, clearly suggesting that ER-IAT scores are not redundant with explicit measures. Moreover, the ER-IAT assesses a different regulatory process than do existing, explicit measures of automatic emotion regulation.

STUDY 2: IMPLICIT EVALUATION OF EMOTION REGULATION AND AFFECTIVE RESPONSES TO AN ANGER PROVOCATION

Our goal in Study 2 was to assess whether greater positive implicit evaluation of emotion regulation would be associated with experiential, behavioral, and cardiovascular responses to a laboratory anger provocation and, if so, whether these outcomes would be consistent with automatic regulation of emotion. An anger provocation was chosen as the emotional context in which to examine the correlates of the ER-IAT for two reasons. First, anger is an emotion that is frequently regulated in everyday life (Gross, Richards, & John, in press; Hochschild, 1983; Stearns & Stearns, 1986). Second, anger is seen as a negative emotion that must at times be controlled (Timmers, Fischer, & Manstead, 1998) and at times be expressed (Stearns & Stearns, 1986). Anger thus seems to be an ideal context for studying the activation of emotion regulatory processes. Because these anger-related emotion regulatory goals appear to apply with particular force to women (Timmers et al., 1998), and to minimize variance due to gender differences, only female participants were used.

To make it more likely that automatic rather than deliberate regulatory processes would occur, no explicit regulatory instructions were given to participants. Also, participants were not aware that the study was investigating emotional reactivity. In addition, we controlled for deliberate emotion regulation by assessing with self-reports the extent to which participants had consciously exerted control over their emotion. This was done to help rule out the possibility that the ER-IAT's effects were due to deliberate—as opposed to automatic—emotion regulation. Five domains of affective responding were measured, including anger and relaxation experience, angry thoughts, facial and verbal anger behavior, cardiovascular responses, and self-reported deliberate emotion regulation. Particular care was taken to assess multiple measures of cardiovascular responding, including sympathetic activation, cardiac output, total peripheral resistance, and blood pressure, because cardiovascular responding is multidimensional and maladaptive cardiovascular responding cannot be characterized by one measure alone (e.g., Lacey, 1967; Stern & Sison, 1990). Greater cardiac activation (sympathetic responding and cardiac output) is indicative of a maladaptive threat response in the context of greater vascular responding (especially total peripheral resistance) but indicative of an adaptive challenge response in the context of lower vascular responding (Mendes, Reis, Seery, & Blascovich, 2003; Tomaka, Blascovich, Kelsey, & Leitten, 1993). Sampling broadly from multiple domains of affective responding allowed us to (a) assess the effects of positive implicit evaluation of emotion regulation not only on self-reported anger experience but also on measures that reflect a calm state (relaxation) and on measures less subject to deliberate control (angry thoughts, physiological responding), (b) assess the physiological cost of positive implicit evaluation of emotion regulation, including more maladaptive threat versus more adaptive challenge patterns of cardiovascular activation, and (c) control for the involvement of deliberate emotion regulation in the observed associations.

Based on prior research and on theoretical reasoning, we predicted that in response to an anger provocation, greater positive implicit evaluation of emotion regulation (i.e., greater ER-IAT scores) would be associated with lesser self-reported anger experience, greater self-reported relaxation experience, fewer angry thoughts, lesser anger behavior, and a challenge pattern of cardiovascular activation (i.e., greater sympathetic cardiac responding and lower total peripheral resistance). We also predicted that it would not be associated with heightened self-reports of deliberate emotion control.

METHOD

Participants

Forty-two female students (*M* age = 20.6, *SD* = 5.6) participated in this two-session study. In the first session, anger was induced in individual laboratory sessions, whereas experiential, behavioral, and cardiovascular responses were assessed. In the second session, participants returned to complete the ER-IAT. Two participants were excluded from analyses because they did not return to the second session. The ethnic composition of the sample was mixed: 2% African American, 5% Asian American, 58% Caucasian American, 18% Latino American, and 17% with other or multiple ethnic identities.

Procedure

In the first experimental session, which was videotaped, participants were told that the study was con-

cerned with cognitive performance and mood. After physiological sensors were attached, participants watched a neutral 5-min film while baseline responses were collected and then reported on their frustration, annoyance, anger, and relaxation experience (along with 13 distractor terms). Participants then performed a tedious counting task designed to induce anger. To ensure that results were independent of the specific task, two different anger-provoking tasks were chosen. For half of the participants, the task was based on the d2 concentration endurance test (Spreen & Strauss, 1991), requiring participants to quickly count letters with minute differences on a blurry copy. Following Stemmler (1997), the other half of the participants were required during four 1-min periods to count backward in steps of 7 (for the first two trials) or 13 (for the last two trials) from large numbers (e.g., 18, 652).[4] Both tasks took an average of 8 min. In both conditions, the experimenter interrupted the participant multiple times with scripted remarks on the participant's performance and cooperation, delivered in an increasingly impatient tone of voice. After the first task, participants were instructed that they were "producing artifacts" by "moving their hand" and that they had "to speak more loudly." At the end of the anger provocation, the experimenter said, "Let's just stop here. Just fill out the next section in your questionnaire packet," with an irritated tone that implied that the whole session had not gone properly.

After the anger provocation, participants completed another emotion experience questionnaire and were prompted to write down any thoughts that went through their minds during the task. Sensors were removed and a funneled debriefing procedure was used to assess the extent to which participants were aware of the true nature of the task (Bargh & Chartrand, 2000). Of the 42 participants, 33 did not report any suspicion at all, 5 reported some suspicion, and 4 reported strong suspicion. Secondary analyses were performed using only participants who reported no suspicion and yielded results comparable to analyses that included participants with some suspicion. Therefore, results presented are based on all participants.

Participants returned for a second session on average 26 days later ($SD = 47$) and completed the ER-IAT. We obtained IAT data after the anger provocation to minimize the likelihood that participants would become aware of the purpose of the anger provocation.

Measures

Individual differences in implicit evaluation of emotion regulation were assessed using the ER-IAT described in Study 1.

Deliberate state emotion control was assessed with two self-report items—"I tried to control my emotions during the task" and "I wanted to control my emotions during the task"—with ratings on 11-point Likert scales ranging from 0 (*not at all*) to 10 (*extremely*) ($\alpha = .69$).

Emotion experience was assessed after the baseline and the anger provocation with ratings on 11-point Likert scales ranging from 0 (*none at all*) to 10 (*extremely*). An anger experience composite was formed using the terms "frustration," "annoyance," and "anger" (Cronbach's $\alpha = .73$); relaxation was measured with one item.

Angry thoughts were assessed by coding the thoughts that participants wrote down immediately after the anger provocation. Two judges blind to the hypotheses of the study counted both the total number of words and the number of anger words (e.g., "I am angry" or "Damn!"; interrater reliability, $\alpha = .95$) from which percentage of anger words was computed.

Anger behavior was assessed by coding facial and verbal expressions in the videotapes made during the session. Two judges rated facial behavioral responses during the anger provocation on a scale from 1 (*none at all*) to 5 (*extreme amounts*) based on the dimensions amount of anger displayed in the face, number of annoyed eye movements, tone, and loudness of voice (interrater reliability $\alpha = .79$).

Cardiovascular responding was measured with four measures that were sampled at 400 Hz using laboratory software—sympathetic activation (SA), cardiac output (CO), mean arterial blood pressure (MAP), and total peripheral resistance (TPR)—because (a) they are involved in anger responding and emotion regulation (Gross & Levenson, 1997) and (b) they are important for differentiating (more maladaptive) threat from (more adaptive) challenge patterns within overall activation (Mendes et al., 2003; Tomaka et al., 1993). In addition, somatic activity was assessed to control for the effects of body movement on cardiovascular activation. Heart rate (beats/Min) was calculated from RR intervals in the electrocardiogram. Finger pulse amplitude (FPA) was assessed using a plethysmograph transducer attached to the tip of the participant's second finger. Finger pulse transit time (FPTT) was indexed by the time (in ms) elapsed between the closest previous R-wave and the upstroke of the peripheral pulse at the finger. Ear pulse amplitude (EPA) and transit time (EPTT) were determined similarly using a UFI plethysmograph transducer attached to the participant's left ear. SA was assessed with a composite of reverse and *z* scored FPA, EPA, FPTT, and EPTT ($\alpha = .55$). MAP (mmHg) was obtained from the third finger of the nondominant hand by means of the Finapres 2300 (Ohmeda, Madison, WI) system. From this signal, beat-to-beat stroke volume was measured using Wesseling's pulse-contour analysis method (BEATFAST, TNO-Biomedical Instrumentation, Amsterdam). CO (l/Min) was calculated as Stroke Volume ×

TABLE 3: Study 2: Pearson's Correlations Between ER-IAT Scores and Emotion Experience, Thoughts and Behavior, and Cardiovascular Reactivity (All Change Scores From Baseline), Controlling for Deliberate Control (Column 1) and Not Controlling for Deliberate Control (Column 2)

		Pearson's r*s*	
		ER-IAT (Controlling for Deliberate Control)	*ER-IAT*
Self-reported experience	Anger (0-10)	–.36*	–.36*
Change scores from baseline	Relaxation (0-10)	.48**	.50**
Thoughts and behavior[a]	Percentage of angry words in thoughts	–.46**	–.47**
	Anger behavior (standardized units)	–.20	–.17
Cardiovascular reactivity	Sympathetic activation		
(Change scores from baseline)[a]	(Standardized units)	.35*	.30†
	Cardiac output (l/Min)	.37*	.29†
	Mean arterial blood pressure (mmHg)	.04	–.01
	Total peripheral resistance (dyne*sec/cm5)	–.45**	–.43**

NOTE: ER-IAT = Emotion Regulation–Implicit Association Test. *N*s = 36-40 (depending on missing values).
a. Because of technical problems, four participants were not recorded on the video tapes, resulting in missing behavior codes. For three participants, heart rate and mean arterial blood pressure (MAP) measurements were faulty, and for six participants, somatic activity was not recorded.
†$p < .10$. *$p < .05$. **$p < .01$.

Heart Rate. TPR (dyne*sec/cm^5) was calculated as (MAP × 80)/CO. Somatic activity (A-D units) was measured by a piezo-electric device attached to the subject's chair. This device generates an electrical signal proportional to the subject's overall body movement in any direction. Established methods were applied for artifact control and data reduction (cf. Wilhelm, Grossman, & Roth, 1999).

Data Reduction and Analysis

First, to ascertain that the anger provocation was successful, a paired *t* test was used to compare anger experience and mean arterial blood pressure for the baseline to anger experience and mean arterial blood pressure for the anger provocation. Then, to ascertain that the regulatory processes associated with ER-IAT scores were automatic, a Pearson's correlation between ER-IAT scores and state self-reported emotion control was obtained. Somewhat surprisingly, ER-IAT scores were modestly negatively related to deliberate emotion control, $r = -.30$, $p = .06$. This finding supports the notion that ER-IAT scores tap into an automatic process but contrasts with the modest and positive correlations with self-reported trait emotion control.[5] Because we wished to obtain the purest estimate of automatic (as opposed to deliberate) emotion regulation possible, we partialed out state self-reported emotion control from the ER-IAT scores before correlating these scores with measures of emotion experience, angry thoughts, anger behavior, and cardiovascular responding. In secondary analyses using simple ER-IAT scores, the same pattern of results obtained. For physiological measures, averages were obtained for all measures across the 5-min baseline and across the cognitive performance tasks. For analyses of experience and cardiovascular responses, change scores (anger provocation – baseline) were used to control for individual differences at baseline. For analyses of thoughts and behaviors, raw scores were used.

RESULTS AND DISCUSSION

Effectiveness of the Anger Provocation

A paired *t* test indicated that participants experienced more anger after the anger provocation ($M = 4.0$, $SD = 2.7$) than after the baseline film (0.8, 0.9), $t(41) = 8.54$, $p < .001$. Likewise, participants exhibited greater mean arterial blood pressure during the anger provocation (108.0, 16.9) than during the baseline (92.0, 13.8), $t(41) = 11.7$, $p < .001$, suggesting that the anger provocation was successful in terms of anger experience as well as in terms of a key physiological indicator of anger.

Emotion Experience, Thoughts, and Behavior

As shown in Table 3, individuals with higher ER-IAT scores (more positive implicit evaluation of emotion regulation, with deliberate control partialed out) reported lesser anger experience (see Figure 1, Panel a) and greater relaxation experience. Moreover, positive implicit evaluation of emotion regulation was associated with a smaller percentage of angry words in the thoughts provided after the anger provocation (see Figure 1, Panel b). These relationships held when using simple ER-IAT scores. In contrast, more positive implicit evaluation of emotion regulation was not significantly associated with anger behavior during the anger provocation.

Cardiovascular Reactivity

As indicated in Table 3, more positive implicit evaluation of emotion regulation was associated with greater

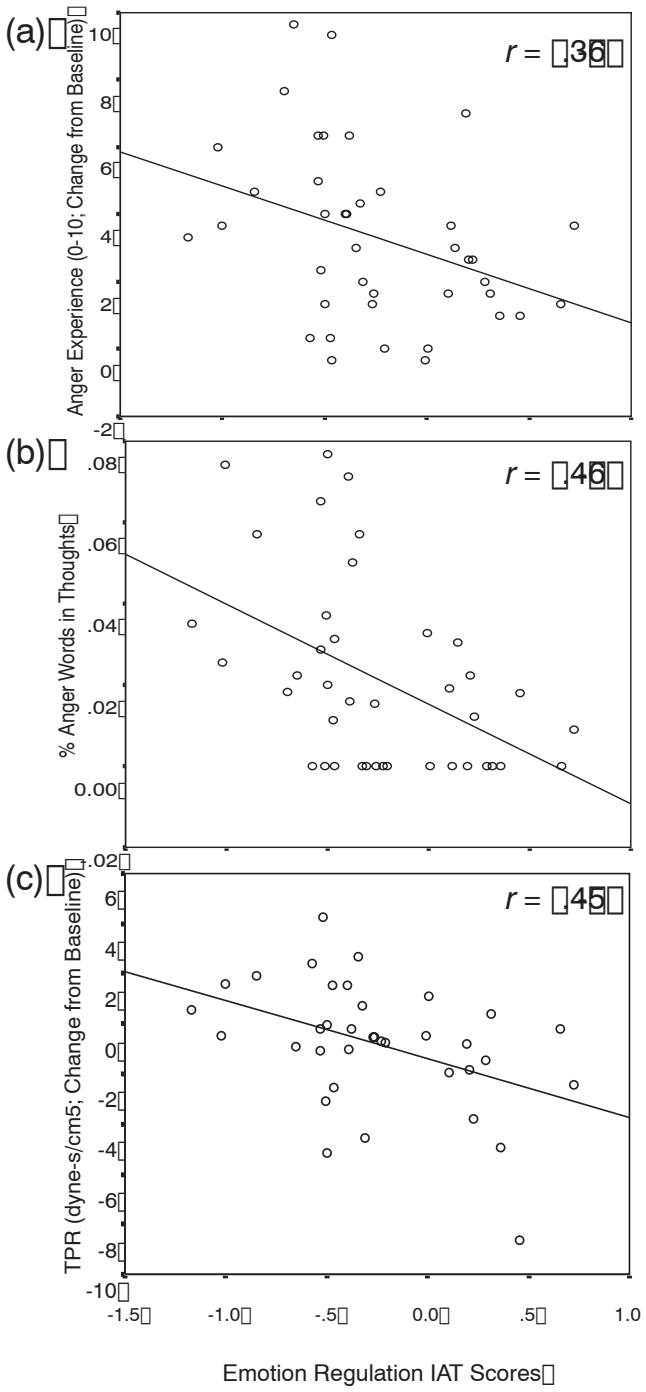

Figure 1 Scatter plots of Emotion Regulation–Implicit Association Test scores (controlling for deliberate control) and anger experience (panel a), angry thoughts (panel b), and total peripheral resistance (TPR; panel c).

SA, greater CO, and lower TPR (see Figure 1, Panel c). In contrast, more positive implicit evaluation of emotion regulation was not associated with MAP during the anger provocation. These relationships were slightly diminished for SA and CO but held for TPR when using simple ER-IAT scores. All results held when controlling for somatic activity.

Taken together, findings from Study 2 indicate that greater positive implicit evaluation of emotion regulation was associated with changes in affective responses to an anger provocation consistent with automatic emotion regulation. Greater positive implicit evaluation of emotion regulation was not associated with greater state self-reported emotion control; indeed, there was a modest negative association between the two. Positive implicit evaluation of emotion regulation was associated with successful reduction of anger experience and thoughts as well as an adaptive challenge (as opposed to a threat) cardiovascular activation pattern, characterized by greater SA, greater CO, no effects on MAP, and lower TPR (cf. Tomaka et al., 1993). It was not related to anger behavior (*p*s > .15). However, overall levels of anger behavior were relatively modest in this context, which may have limited our ability to detect any decreases in anger behavior associated with greater implicit emotion regulation values. Together, these results suggest that ER-IAT scores are associated with affective responses that are consistent with automatic, successful, and physiologically adaptive emotion regulation.

GENERAL DISCUSSION

Emotion regulation has long been assumed to be potentially detrimental to the individual. After all, there is no such thing as a free lunch, and the clinical literature on repression suggests that especially automatic regulatory processes may be costly. More recent studies from personality and social psychology, however, indicate that many goals may be pursued automatically, and often in ways that do not appear to be costly. Might emotion regulation also be pursued automatically and without cost? To find out, we adapted the IAT to measure implicit evaluation of emotion regulation and tested whether this evaluation would be associated with actual responses to an anger provocation that are consistent with effective, automatic, and physiologically adaptive emotion regulation. Our approach expanded on the existing literature in three important ways. First, the Emotion Regulation–IAT provides a novel, reliable, and valid way of assessing implicit evaluation of emotion regulation. In addition, we controlled for the extent to which participants exerted deliberate control, further improving the validity of the ER-IAT. Second, each of the major domains of anger responding was assessed, including anger experience, angry thoughts, anger behavior, and key cardiovascular responses. Because these domains are not perfectly correlated (e.g., Mauss, Levenson, McCarter, Wilhelm, & Gross, 2005; Russell, 2003),[6] each measure adds knowledge about the underlying mechanisms and

the implications of the present findings. For example, assessing self-reports of anger experience alone would be limiting because they may be subject to social desirability and impression management (Feldman-Barrett, 1996). In the domain of cardiovascular responding, assessing multiple indices allowed us to differentiate not just activation from deactivation but more versus less adaptive patterns of cardiovascular responding. Third, responses were assessed on-line in the context of an anger provocation designed to be effective and to have high ecological validity. This is an important strength given the influence of impression management, limited introspective insight, and memory biases on people's descriptions of emotional events (e.g., Feldman-Barrett, 1997). Together, these features allow for a number of conclusions about implicit evaluation of emotion regulation, with implications that extend to individuals' well-being, psychosocial functioning, and health, as well as to sociocultural variation in emotional responding.

Implicit Evaluation of Emotion Regulation and Emotional Responding

Study 1 tackled the issue of how to measure the chronically elusive phenomenon of implicit evaluation of emotion regulation. Results from this study support that the ER-IAT has face validity, taps a relatively stable individual difference, and converges (but is not redundant) with explicit evaluation of emotion regulation, explicit emotion expression, and explicit emotion regulation. Study 2 showed that the ER-IAT had predictive validity with respect to key measures of emotional responding and was moderately negatively associated with self-reported deliberate emotion control. This supports the interpretation that the positive implicit evaluation of emotion regulation (relative to emotion expression) that is measured with the ER-IAT translates into actual regulation of emotion and that this regulation occurs outside of participants' awareness.

Results from Study 2 suggest that the emotion regulatory processes indexed by positive implicit evaluation of emotion regulation are accompanied by reduction of anger experience and thoughts and a challenge cardiovascular activation pattern. The fact that this reduction in anger is not associated with greater self-reported (deliberate and consciously executed) emotion control is consistent with the interpretation that it is executed in an automatic fashion. Such automatic emotion regulation seems to be an effective way to feel less angry and more relaxed in the face of an anger-provoking situation; thus, it appears to circumvent ironic effects (e.g., increased feelings of tension or inauthenticity) that could come with deliberate emotion regulation (Gross & John, 2003; Polivy, 1998). Of interest, ER-IAT scores were not related to trait reports of emotion experience in Study 1, suggesting that automatic regulatory goals might be flexibly activated in specific situations rather than being associated with situation-general trait reports. Such a flexible regulatory process might be more adaptive than one that is activated chronically (cf. Bonanno et al., 2004; Koole & Jostmann, 2004). Moreover, the fact that associations extended to a subtle measure of thought content and to autonomic physiological responding indicates that participants engaged in a regulatory process more transformative than merely denying feelings of anger and that this regulatory process possibly sets in before the whole emotional impulse unfolds (cf. Gross, 1998; Gross & John, 2003).

The emotion regulatory processes associated with implicit positive evaluation of emotion regulation, although effective in down-regulating anger, may be less physiologically costly than regulation associated with explicit positive evaluation of emotion regulation. Deliberate emotion regulation has been associated with increased cardiovascular responding, including sympathetic activation and blood pressure (e.g., Butler et al., 2003; Richards & Gross, 1999), a pattern of activation most consistent with a threat response. By contrast, the physiological correlates of greater implicit positive evaluation of emotion regulation (greater cardiac but lower vascular activation, stable blood pressure) constitute a challenge pattern of cardiovascular responding, which is thought to indicate active coping and to be relatively adaptive (e.g., Mendes et al., 2003; Tomaka et al., 1993). These results raise the intriguing possibility that emotion regulation engendered by implicit positive evaluation of emotion regulation has the benefits but not the costs of effective emotion regulation.

If maintained throughout a longer period of time (as suggested by the ER-IAT test-retest reliability of .7), emotion regulation associated with implicit positive evaluation of emotion regulation might have far-reaching implications for individuals' well-being, psychosocial functioning, and health. Anger regulation is of central importance for adaptive functioning in many domains of individuals' lives, including daily tasks (e.g., driving), family relationships, friendships, romantic relationships, the workplace, and politics (e.g., R. J. Davidson, Putnam, & Larson, 2000; Deffenbacher, Deffenbacher, Lynch, & Richards, 2003; Gross et al., in press; Howells, 2004). In addition to functioning in various domains of everyday life, emotion regulation has been related to psychological health outcomes such as depression or anxiety disorders (Chemtob, Novaco, Hamada, Gross, & Smith, 1997; Gross & Muñoz, 1995; Morrow & Nolen-Hoeksema, 1990). Similarly, successful regulation of emotions might be linked to better physical health outcomes (e.g., Dienstbier, 1989; Uchino, Cacioppo, & Kiecolt-Glaser, 1996). In sum, individuals' ability to suc-

cessfully execute the task of anger regulation, without incurring a cost, might have beneficial cumulative effects in a wide range of domains.

The present findings also have implications that extend beyond the individual. The implicit evaluation of emotion regulation that is measured with the ER-IAT seems to correspond closely to implicit norms and regulatory goals (Rudman, 2004), which vary systematically with cultural contexts. Such norms and goals constitute important channels through which socialization and cultures shape individuals' emotions (Eisenberg, Smith, Sadovsky, & Spinrad, 2004; Markus & Kitayama, 1992; Mesquita, 2001). The fact that such deeply ingrained, culturally transmitted norms are often inaccessible to introspection (D'Andrade, 1984) might explain why cultural differences have been difficult to understand using explicit measures. By providing a methodological and conceptual framework for implicit norms and goals regarding emotion regulation, the present research provides a means of investigating not only individual but also cultural differences in emotional responding.

Alternative Explanations

Two important and plausible alternative hypotheses for the present results are of interest. First, it may be that the ER-IAT corresponds to mere values about emotion regulation rather than to the skill or the motivation to execute emotion regulation. After all, the IAT is thought to assess evaluations and attitudes rather than skills and motivations. However, the fact that higher ER-IAT scores were associated with lessened anger experience, angry thoughts, and a cardiovascular challenge pattern in an anger provocation speak against this alternative explanation. It suggests that the evaluations assessed with the ER-IAT are reliably associated with experiential, cognitive, and physiological responses in an actual emotional situation. This finding dovetails with research on the IAT in other domains that shows that implicit attitudes measured with the IAT predict corresponding behaviors and physiological responses (e.g., Egloff & Schmukle, 2002; Fazio & Olson, 2003; McConnell & Leibold, 2001; Phelps et al., 2000).

Furthermore, the fact that state self-reported emotion control was not (and even modestly negatively) associated with ER-IAT scores might be explained by self-reported emotion control not being an accurate expression of participants' actual regulatory processes. Indeed, this account is supported by the finding that self-reported, consciously executed emotion control was not associated with self-reported experience of anger (r = .01, p = .94) or explicit trait evaluation of emotion regulation (r = –.13, p = .42). Rather than limiting the validity of the ER-IAT, this result suggests that participants may have very limited introspective insight into their own regulatory processes. This finding again dovetails with research on automaticity that suggests that many, even higher-level, goals can be executed without conscious insight into these processes (e.g., Bargh et al., 2001).

Second, it might be argued that rather than predicting emotion regulation, the ER-IAT is associated simply with lesser emotion reactivity. Thus, participants with higher ER-IAT scores might initially respond with less anger to the provocation, without engaging in regulatory processes. However, the present pattern of results does not support this interpretation because lesser anger reactivity would lead one to expect lesser sympathetic and lesser blood pressure responses (e.g., Stemmler, 1997). In contrast, higher ER-IAT scores were associated with greater sympathetic activation and not related to blood pressure, rendering this alternative explanation unlikely. Together, these findings speak against two important alternative explanations and support the notion that ER-IAT scores are indeed associated with regulatory processes, which are effective, automatic, and occur out of participants' awareness.

Limitations and Future Directions

The present studies suggest a number of compelling directions for future research. In the following section, we consider three of the most pressing of these future directions.

First, it will be important to assess the extent to which emotion regulation associated with implicit positive evaluation of emotion regulation has comparable effects in other contexts (e.g., in situations other than our laboratory-based anger provocations) and with other types of participants (e.g., in other age groups, among men, and in other cultures). Our ER-IAT was not specific to either our target emotion (anger) or to our participant group (women). Indeed, the present findings regarding automatic processes in emotion regulation suggest the possibility that they may share operating principles with many other forms of self-regulation. Similar to negative emotions, mental processes such as thoughts or attention, and undesired behaviors such as binge eating or procrastination, are subject to the problem of how they can be controlled without the often ironic and deleterious effects of deliberate control (e.g., Polivy, 1998; Wegner, 1994). The current research dovetails with other research showing that automatic and habitual self-control might be a very effective means of reaching desired mental processes and behaviors (e.g., Aarts & Dijksterhuis, 2000; Bargh et al., 2001; Fitzsimons & Bargh, 2004). It is not yet clear, however, to what extent the present findings will generalize to other contexts, participants, and forms of self-regulation.

Second, the present findings—in conjunction with prior research on deliberate emotion regulation—

suggest that automatic emotion regulation may be a more effective and efficient way to manage anger. However, direct comparisons of automatic and various types of deliberate emotion regulation strategies are needed to further support this account. This also will permit a better understanding of how automatic emotion regulatory processes relate to other adaptive regulatory strategies such as reappraisal (e.g., Gross & John, 2003; Zillmann, 1993), constructive anger expression (e.g., K. Davidson, MacGregor, Stuhr, Dixon, & MacLean, 2000), positive affective style (e.g., R. J. Davidson, 2000), or emotional intelligence (e.g., Feldman-Barrett & Gross, 2001; Salovey et al., 1993). For example, reappraisal and constructive anger expression might be most successful and adaptive when they are consistent with individuals' implicit attitudes and as they become automatized through frequent practice.

Third, given how little is known about automatic emotion regulation processes, in future studies it will be important to assess additional outcome measures (e.g., social functioning, startle magnitude, brain activation). This will permit a clearer understanding of the mechanisms underlying the present effects. Although existing research on automaticity suggests some mechanisms such as the activation of implicit goals (e.g., Banaji, Blair, & Glaser, 1997; Fitzsimons & Bargh, 2004) and implicitly activated situational norms (Aarts & Dijksterhuis, 2000, 2003), more research is needed to clarify how some people seem to be capable—without conscious effort—of remaining calm, cool, and collected in a powerfully negative situation.

NOTES

1. For brevity, the terms "emotion regulation" or "control" will be used to refer to "emotion down-regulation."

2. We assessed explicit measures after the Implicit Association Test (IAT) because the purpose of the IAT measure is less evident to participants than that of the explicit measures. This ordering therefore minimizes carry-over from IAT to the explicit measures. Moreover, research suggests that ordering of explicit and IAT measures does not affect the means of either type of measure (Egloff & Schmukle, 2002).

3. We did not counterbalance the order of blocks because we were only interested in obtaining the relative ordering of individuals' IAT effects (cf. Egloff & Schmukle, 2002).

4. In secondary analyses, it was assessed whether the type of anger induction affected the results by entering Type of Anger Provocation as a factor; Emotion Regulation–IAT (ER-IAT) scores as a covariate; and measures of anger experience, thoughts, behavior, and physiological responding as dependent variables in ANCOVAs. None of the Type of Anger Provocation by ER-IAT interactions reached significance (all *p*s > .29), indicating that the type of anger provocation did not affect results.

5. Why were ER-IAT scores positively related to explicit trait emotion control but modestly negatively related to deliberate state emotion control? Implicit and explicit trait measures might both tap into a common source, evaluation of emotion regulation, reflected in their positive association. On the other hand, as described in more detail in the Alternative Explanations section, state self-reported emotion control might not be an accurate expression of participants' actual regulatory processes.

6. Correlations between change scores of self-reported anger and the other outcome measures were as follows: self-reported relaxation experience (change scores), $r = -.48$, $p = .001$; angry thoughts, $r = .36$, $p = .02$; anger behavior, $r = .26$, $p = .14$; sympathetic activation (SA) (change scores), $r = .02$, $p = .92$; CO (change scores), $r = .24$, $p = .14$; total peripheral resistance (TPR) (change scores), $r = .06$, $p = .07$.

REFERENCES

Aarts, H., & Dijksterhuis, A. (2000). Habits as knowledge structures: Automaticity in goal-directed behavior. *Journal of Personality and Social Psychology, 78*, 53-63.

Aarts, H., & Dijksterhuis, A. (2003). The silence of the library: Environment, situational norm, and social behavior. *Journal of Personality and Social Psychology, 84*, 18-28.

Asendorpf, J. B., & Scherer, K. R. (1983). The discrepant repressor: Differentiation between low anxiety, high anxiety, and repression of anxiety by autonomic-facial-verbal patterns of behavior. *Journal of Personality and Social Psychology, 45*, 1334-1346.

Bagby, R. M., Parker, J. D. A., & Taylor, G. J. (1994). The twenty-item Toronto Alexithymia Scale: I. Item selection and cross-validation of the factor structure. *Journal of Psychosomatic Research, 38*, 23-32.

Banaji, M. R., Blair, I. V., & Glaser, J. (1997). Environments and unconscious processes. In R. S. Wyer (Ed.), *The automaticity of everyday life: Advances in social cognition* (Vol. 10, pp. 63-74). Mahwah, NJ: Lawrence Erlbaum.

Banse, R., Seise, J., & Zerbes, N. (2001). Implicit attitudes towards homosexuality: Reliability, validity, and controllability of the IAT. *Zeitschrift für Experimentelle Psychologie, 48*, 145-160.

Bargh, J. A. (1994). The four horsemen of automaticity: Awareness, intention, efficiency, and control in social cognition. In R. S. Wyer & T. K. Srull (Eds.), *Handbook of social cognition* (2nd ed.; pp. 1-40). Hillsdale, NJ: Englandiates.

Bargh, J. A., & Chartrand, T. L. (2000). The mind in the middle: A practical guide to priming and automaticity research. In H. T. Reis & C. M. Judd (Eds.), *Handbook of research methods in social and personality psychology* (pp. 253-285). New York: Cambridge University Press.

Bargh, J. A., Gollwitzer, P. M., Lee-Chai, A., Barndollar, K., & Troetschel, R. (2001). The automated will: Nonconscious activation and pursuit of behavioral goals. *Journal of Personality and Social Psychology, 81*, 1014-1027.

Baumeister, R. F., & Exline, J. J. (2000). Self-control, morality, and human strength. *Journal of Social and Clinical Psychology, 19*, 29-42.

Beck, A. T., & Steer, R. A. (1984). Internal consistencies of the original and revised Beck Depression Inventory. *Journal of Clinical Psychology, 40*, 1365-1367.

Blair, I. V. (2002). The malleability of automatic stereotypes and prejudice. *Personality and Social Psychology Review, 6*, 242-261.

Bodenhausen, G. V., Macrae, C. N., & Hugenberg, K. (2003). Social cognition. In T. Millon & M. J. Lerner (Eds.), *Handbook of psychology: Personality and social psychology* (pp. 257-282). New York: John Wiley.

Bonanno, G. A., Papa, A., Lalande, K., Westphal, M., & Coifman, K. (2004). The importance of being flexible: The ability to both enhance and suppress emotional expression predicts long-term adjustment. *Psychological Science, 15*, 482-487.

Brendl, C. M., Markman, A. B., & Messner, C. (2001). How do indirect measures of evaluation work? Evaluating the inference of prejudice in the Implicit Association Test. *Journal of Personality and Social Psychology, 81*, 760-773.

Brosschot, J. F., & Janssen, E. (1998). Continuous monitoring of affective-autonomic response dissociation in repressors during negative emotional stimulation. *Personality and Individual Differences, 25*, 69-84.

Butler, E. A., Egloff, B., Wilhelm, F. W., Smith, N. C., Erickson, E. A., & Gross, J. J. (2003). The social consequences of expressive suppression. *Emotion, 3*, 48-67.

Byrne, D., Golightly, C., & Sheffield, J. (1965) The repression-sensitization scale as a measure of adjustment: Relationship with the CPI. *Journal of Consulting Psychology, 29*, 586-589.

Chartrand, T. L., & Jefferis, V. E. (2003). Consequences of automatic goal pursuit and the case of nonconscious mimicry. In J. P. Forgas, K. D. Williams, & W. Von Hippel (Eds.), *Social judgments: Implicit and explicit processes* (pp. 290-305). New York: Cambridge University Press.

Chemtob, C. M., Novaco, R. W., Hamada, R. S., Gross, D. M., & Smith, G. (1997). Anger regulation deficits in combat-related posttraumatic stress disorder. *Journal of Traumatic Stress, 10*, 17-36.

Cole, P. M., Martin, S. E., & Dennis, T. A. (2004). Emotion regulation as a scientific construct: Methodological challenges and directions for child development research. *Child Development, 75*, 317-333.

Crowne, D. P., & Marlowe, D. (1960). A new scale of social desirability independent of psychopathology. *Journal of Consulting Psychology, 24*, 349-354.

D'Andrade, R. (1984). Cultural meaning systems. In R. A. Shweder & R. A. LeVine (Eds.), *Culture theory. Essays on mind, self, and emotion* (pp. 88-119). Cambridge, MA: Cambridge University Press.

Dasgupta, N., & Asgari, S. (2004). Seeing is believing: Exposure to counterstereotypic women leaders and its effect on the malleability of automatic gender stereotyping. *Journal of Experimental Social Psychology, 40*, 642-658.

Dasgupta, N., McGhee, D. E., Greenwald, A. G., & Banaji, M. R. (2000). Automatic preference for White Americans: Eliminating the familiarity explanation. *Journal of Experimental Social Psychology, 36*, 316-328.

Davidson, K., MacGregor, M. W., Stuhr, J., Dixon, K., & MacLean, D. (2000). Constructive anger verbal behavior predicts blood pressure in a population-based sample. *Health Psychology, 19*, 55-64.

Davidson, R. J. (2000). Affective style, psychopathology, and resilience: Brain mechanisms and plasticity. *American Psychologist, 55*, 1196-1214.

Davidson, R. J., Jackson, D. C., & Kalin, N. H. (2000). Emotion, plasticity, context, and regulation: Perspectives from affective neuroscience. *Psychological Bulletin, 126*, 890-909.

Davidson, R. J., Putnam, K. M., & Larson, C. L. (2000). Dysfunction in the neural circuitry of emotion regulation: A possible prelude to violence. *Science, 289*(5479), 591-594.

Deffenbacher, J. L., Deffenbacher, D. M., Lynch, R. S., & Richards, T. L. (2003). Anger, aggression and risky behavior: A comparison of high and low anger drivers. *Behaviour Research and Therapy, 41*(6), 701-718.

Dembroski, T. M., MacDougall, J. M., Williams, R. B., Haney, T. L., & Blumenthal, J. A. (1985). Components of Type A, hostility, and anger-in: Relationship to angiographic findings. *Psychosomatic Medicine, 47*, 219-233.

Dienstbier, R. A. (1989). Arousal and physiological toughness: Implications for mental and physical health. *Psychological Review, 96*, 84-100.

Egloff, B., & Schmukle, S. C. (2002). Predictive validity of an implicit association test for assessing anxiety. *Journal of Personality and Social Psychology, 83*, 1441-1455.

Eisenberg, N., Smith, C. L., Sadovsky, A., & Spinrad, T. L. (2004). Effortful control: Relations with emotion regulation, adjustment, and socialization in childhood. In R. F. Baumeister & K. D. Vohs (Eds.), *Handbook of self-regulation: Research, theory, and applications* (pp. 259-282). New York: Guilford.

Eisenberg, N., & Spinrad, T. L. (2004). Emotion-related regulation: Sharpening the definition. *Child Development, 75*, 334-339.

Erdelyi, M. H. (2001). Defense processes can be conscious or unconscious. *American Psychologist, 56*, 761-762.

Fazio, R. H., & Olson, M. A. (2003). Implicit measures in social cognition research: Their meaning and uses. *Annual Review of Psychology, 54*, 297-327.

Feldman-Barrett, L. (1996). Hedonic tone, perceived arousal, and item desirability: Three components of self-reported mood. *Cognition and Emotion, 10*, 47-68.

Feldman-Barrett, L. (1997). The relationships among momentary emotion experiences, personality descriptions, and retrospective ratings of emotion. *Personality and Social Psychology Bulletin, 23*, 1100-1110.

Feldman-Barrett, L., & Gross, J. J. (2001). Emotional intelligence: A process model of emotion representation and regulation. In T. J. Mayne & G. A. Bonanno (Eds.), *Emotions: Current issues and future directions* (pp. 286-310). New York: Guilford.

Fitzsimons, G. M., & Bargh, J. A. (2004). Automatic self-regulation. In R. F. Baumeister & K. D. Vohs (Eds.), *Handbook of self-regulation: Research, theory, and applications* (pp. 151-170). New York: Guilford.

Freud, S. (1961). Civilization and its discontents. In J. Strachey (Ed. and Trans.), *The standard edition of the complete psychological works of Sigmund Freud* (Vol. 31). New York: Norton. (Original work published 1930)

Goldsmith, H. H., & Davidson, R. J. (2004). Disambiguating the components of emotion regulation. *Child Development, 75*, 361-365.

Greenwald, A. G., & Farnham, S. D. (2000). Using the Implicit Association Test to measure self-esteem and self-concept. *Journal of Personality and Social Psychology, 79*, 1022-1038.

Greenwald, A. G., McGhee, D. E., & Schwartz, J. L. K. (1998). Measuring individual differences in implicit cognition: The Implicit Association Test. *Journal of Personality and Social Psychology, 74*, 1464-1480.

Greenwald, A. G., Nosek, B. A., & Banaji, M. R. (2003). Understanding and using the Implicit Association Test: I. An improved scoring algorithm. *Journal of Personality and Social Psychology, 85*, 197-216.

Gross, J. J. (1998). Antecedent- and response-focused emotion regulation: Divergent consequences for experience, expression, and physiology. *Journal of Personality and Social Psychology, 74*, 224-237.

Gross, J. J., & John, O. P. (1997). Revealing feelings: Facets of emotional expressivity in self-reports, peer ratings, and behavior. *Journal of Personality and Social Psychology, 72*, 435-448.

Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology, 85*, 348-362.

Gross, J. J., & Levenson, R. W. (1997). Hiding feelings: The acute effects of inhibiting positive and negative emotions. *Journal of Abnormal Psychology, 106*, 95-103.

Gross, J. J., & Muñoz, R. F. (1995). Emotion regulation and mental health. *Clinical Psychology: Science and Practice, 2*, 151-164.

Gross, J. J., Richards, J. M., & John, O. P. (in press). Emotion regulation in everyday life. In D. K. Snyder, J. A. Simpson, & J. N. Hughes (Eds.), *Emotion regulation in families: Pathways to dysfunctionand health*. Washington, DC: American Psychological Association.

Hochschild, A. R. (1983). *The managed heart: Commercialization of human feeling*. Berkeley: University of California Press.

Holmes, D. S. (1990). The evidence for repression: an examination of sixty years of research. In J. L. Singer (Ed.), *Repression and dissociation: implications for personality theory, psychopathology, and health* (pp. 85-102). Chicago: University of Chicago Press.

Howells, K. (2004). Anger and its links to violent offending. *Psychiatry, Psychology, and Law, 11*, 189-196.

Jackson, D. C., Mueller, C. J., Dolski, I., Dalton, K. M., Nitschke, J. B., Urry, H. L., et al. (2003). Now you feel it, now you don't: Frontal brain electrical asymmetry and individual differences in emotion regulation. *Psychological Science, 14*, 612-617.

Karpinski, A. (2004). Measuring self-esteem using the Implicit Association Test: The role of the other. *Personality and Social Psychology Bulletin, 30*, 22-34.

Kihlstrom, J. F. (1987). The cognitive unconscious. *Science, 237*, 1445-1455.

Koole, S. L., & Jostmann, N. B. (2004). Getting a grip on your feelings: Effects of action orientation and external demands on intuitive affect regulation. *Journal of Personality and Social Psychology, 87*, 973-990.

Lacey, J. I. (1967). Somatic response patterning and stress: Some revisions of activation theory. In M. H. Appley & R. Trumbull (Eds.), *Psychological stress: Issues in research* (pp. 14-42). New York: Appleton-Century-Crofts.

Markus, H. R., & Kitayama, S. (1992). Culture and the self: Implications for cognition, emotion, and motivation. *Psychological Review, 98*, 224-253.

Martin, R., & Watson, D. (1997). Style of anger expression and its relations to daily experience. *Personality and Social Psychology Bulletin, 23*, 285-294.

Mauss, I. B., Levenson, R. W., McCarter, L., Wilhelm, F. H., & Gross, J. J. (2005). The tie that binds? Coherence among emotional experience, behavior, and autonomic physiology. *Emotion, 5*, 175-190.

McConnell, A., & Leibold, J. M. (2001). Relations among the Implicit Association Test, discriminatory behavior, and explicit measures of racial attitudes. *Journal of Experimental Social Psychology, 37*, 435-442.

Mendes, W. B., Reis, H. T., Seery, M. D., & Blascovich, J. (2003). Cardiovascular correlates of emotional expression and suppression: Do content and gender context matter? *Journal of Personality and Social Psychology, 84*, 771-792.

Mesquita, B. (2001). Culture and emotion: Different approaches to the question. In T. J. Mayne & G. A. Bonanno (Eds.), *Emotions: Current issues and future directions* (pp. 214-250). New York: Guilford.

Mierke, J., & Klauer, K. C. (2003). Method-specific variance in the Implicit Association Test. *Journal of Personality and Social Psychology, 85*, 1180-1192.

Miller, E. K., & Cohen, J. D. (2001). An integrative theory of prefrontal cortex function. *Annual Review of Neuroscience, 24*, 167-202.

Morrow, J., & Nolen-Hoeksema, S. (1990). Effects of responses to depression on the remediation of depressive affect. *Journal of Personality and Social Psychology, 58*, 519-527.

Muraven, M., Tice, D. M., & Baumeister, R. F. (1998). Self-control as a limited resource: Regulatory depletion patterns. *Journal of Personality and Social Psychology, 74*, 774-789.

Ochsner, K. N., Ray, R. R., Cooper, J. C., Robertson, E. R., Chopra, S., Gabrieli, J. D. E., et al. (2004). For better or for worse: Neural systems supporting the cognitive down- and up-regulation of negative emotion. *Neuroimage, 23*, 483-499.

Paulhus, D. L., Fridhandler, B., & Hayes, S. (1997). Psychological defense: Contemporary theory and research. In R. Hogan & J. A. Johnson (Eds.), *Handbook of personality psychology* (pp. 543-579). San Diego, CA: Academic Press.

Phelps, E. A., O'Connor, K. J., Cunningham, W. A., Funayama, E. S., Gatenby, J. C., Gore, J. C., et al. (2000). Performance on indirect measures of race evaluation predicts amygdala activation. *Journal of Cognitive Neuroscience, 12*, 729-738.

Polivy, J. (1998). The effects of behavioral inhibition: Integrating internal cues, cognition, behavior, and affect. *Psychological Inquiry, 9*, 181-204.

Richards, J. M., & Gross, J. J. (1999). Composure at any cost? The cognitive consequences of emotion suppression. *Personality and Social Psychology Bulletin, 25*, 1033-1044.

Rothermund, K., & Wentura, D. (2004). Underlying processes in the Implicit Association Test: Dissociating salience from associations. *Journal of Experimental Psychology: General, 133*, 139-165.

Rudman, L. A. (2004). Sources of implicit attitudes. *Current Directions in Psychological Science, 13*, 79-82.

Russell, J. A. (2003). Core affect and the psychological construction of emotion. *Psychological Review, 110*, 145-172.

Salovey, P., Hsee, C. K., & Mayer, J. D. (1993). Emotional intelligence and the self-regulation of affect. In D. M. Wegner & J. W. Pennebaker (Eds.), *Handbook of mental control: Century psychology series* (pp. 258-277). Upper Saddle River, NJ: Prentice Hall.

Schwartz, G. E. (1995). Psychobiology of repression and health: A systems approach. In J. L. Singer (Ed.), *Repression and dissociation: Implications for personality theory, psychopathology, and health* (pp. 405-434). Chicago: University of Chicago Press.

Spielberger, C. D., & Sydeman, S. J. (1994). State-Trait Anxiety Inventory and State-Trait Anger Expression Inventory. In M. E. Maruish (Ed.), *The use of psychological testing for treatment planning and outcome assessment* (pp. 292-321). Hillsdale, NJ: Lawrence Erlbaum.

Spreen, O., & Strauss, E. (1991). Concentration Endurance Test (d2 Test). In *A compendium of neuropsychological tests: Administration, norms, and commentary* (pp. 431-445). London: Oxford University Press.

Stearns, C. Z., & Stearns, P. N. (1986). *Anger: The struggle for emotional control in America's history*. Chicago: University of Chicago Press.

Stemmler, G. (1997). Selective activation of traits: Boundary conditions of the activation of anger. *Personality and Individual Differences, 22*, 213-233.

Stern, R., & Sison, C. E. E. (1990). Response patterning. In J. T. Cacioppo & L. G. Tassinary (Eds.), *Principles of psychophysiology: Physical, social, and inferential elements* (pp. 193-215). New York: Cambridge University Press.

Tavris, C. (1984). On the wisdom of counting to ten. *Review of Personality and Social Psychology, 5*, 170-191.

Thompson, R. A. (1994). Emotion regulation: A theme in search of definition. *Monographs of the Society for Research in Child Development, 59*, 25-52.

Timmers, M., Fischer, A. H., & Manstead, A. S. R. (1998). Gender differences in motives for regulating emotions. *Personality and Social Psychology Bulletin, 24*, 974-985.

Tomaka, J., Blascovich, J., Kelsey, R. M., & Leitten, C. L. (1993). Subjective, physiological, and behavioral effects of threat and challenge appraisal. *Journal of Personality and Social Psychology, 65*, 248-260.

Uchino, B. N., Cacioppo, J. T., & Kiecolt-Glaser, J. K. (1996). The relationship between social support and physiological processes: A review with emphasis on underlying mechanisms and implications for health. *Psychological Bulletin, 119*, 488-531.

Wegner, D. M. (1994). Ironic processes of mental control. *Psychological Review, 101*, 34-52.

Weinberger, D. A. (1995). The construct validity of the repressive coping style. In J. L. Singer (Ed.), *Repression and dissociation: Implications for personality theory, psychopathology, and health* (pp. 337-386). Chicago: University of Chicago Press.

Wilhelm, F. H., Grossman, P., & Roth, W. T. (1999). Analysis of cardiovascular regulation. *Biomedical Sciences Instrumentation, 35*, 135-140.

Wilson, T. D., & Schooler, J. W. (1991). Thinking too much: Introspection can reduce the quality of preferences and decisions. *Journal of Personality and Social Psychology, 60*, 181-192.

Zillmann, D. (1993). Mental control of angry aggression. In D. Wegner & J. W. Pennebaker (Eds.), *Handbook of mental control* (pp. 370-392). Upper Saddle River, NJ: Prentice Hall.

Received July 18, 2005
Revision accepted August 4, 2005