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Hiding Feelings: The Acute Effects of Inhibiting Negative and Positive Emotion

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Emotion regulation plays a central role in mental health and illness, but little is known about even the most basic forms of emotion regulation. To examine the acute effects of inhibiting negative and positive emotion, we asked 180 female participants to watch sad, neutral, and amusing films under 1 of 2 conditions. Suppression participants (N = 90) inhibited their expressive behavior while watching the films; no suppression participants (N = 90) simply watched the films. Suppression diminished expressive behavior in all 3 films and decreased amusement self-reports in sad and amusing films. Physiologically, suppression had no effect in the neutral film, but clear effects in both negative and positive emotional films, including increased sympathetic activation of the cardiovascular system. On the basis of these findings, we suggest several ways emotional inhibition may influence psychological functioning.

Emotion regulation and dysregulation figure prominently in mental health and illness (Gross & Muñoz, 1995). Indeed, by our count, over half of the nonsubstance related Axis I disorders and all of the Axis II personality disorders involve some form of emotion dysregulation (American Psychiatric Association, 1994; see also Thoits, 1985). Thus, for example, major depressive disorder is characterized by a deficit of positive emotion and/or a surplus of negative emotion; generalized anxiety disorder by heightened levels of anxiety; schizophrenia, disorganized type, by inappropriate emotional responses; and histrionic personality disorder by excessive emotionality.

Despite the manifest importance of emotion regulation to psychological well-being, surprisingly little has been done to document adults' attempts to influence which emotions they have, when they have them, or how these emotions are experienced or expressed.[1] This relative neglect is quite puzzling and invites speculation. Is emotion regulation so ubiquitous that we already know all there is to know about it? This seems unlikely, in that commonsense views of emotion regulation are remarkably inconsistent (e.g., the injunction to count to 10 before acting so that your anger will disappear seems to contradict the conventional wisdom that bottling up your anger will hurt you). A second possibility is that the diversity of emotion regulatory processes simply overwhelms any attempt at scientific analysis. If this view is correct, the reason that little has been done is that little can be done.

Without minimizing its complexity, we propose that emotion regulation can indeed be broken down into pieces that are amenable to empirical study. One way to do this is to study specific clinical populations. Examples of this approach include studies that examine regional lateralization of brain activity in depressed individuals (Henriques & Davidson, 1991) or assess blunted affect in people with schizophrenia (Kring & Neale, in press). A second, complementary approach examines aspects of emotion regulation in nonclinical populations that have particular relevance to clinical syndromes. Such studies both elucidate the fundamental nature of these emotional responses and help establish norms necessary for subsequent determination of whether and how these responses are altered in clinical populations. Examples of this approach can be found in work studying processes of emotional suppression (Gross & Levenson, 1993) or rumination (Nolen-Hoeksema, 1993) in nonclinical or subclinical populations. In this article, we take the second approach, with a particular focus on the inhibition of negative and positive emotion.

Emotional Inhibition: For Better or for Worse?

Civilization seems to require that we inhibit the free play of our emotions, and many have wondered what consequences such emotional inhibition might have (Elias, 1978; Freud, 1961; Tomkins, 1984). Some commentators have feared for the worst. A century ago, for example, Freud argued that emotional inhibition was an important cause of psychological illness, and his talk therapy was designed to release "strangulated affect" whose expression, for one reason or another, had been severely curtailed (Breuer & Freud, 1957/1895, p. 17). Despite the substan-

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[1] This is true despite a recent explosion of interest in the study of developmental aspects of emotion regulation (e.g., Fox, 1994; Garber & Dodge, 1991).

tial changes from Freud's original theory of pathogenesis that occurred over the ensuing decades, the idea that emotional inhibition may lead to psychological distress remains a central tenet of psychodynamic psychotherapy. Accordingly, an important goal of expressive therapies continues to be the fuller expression (e.g., representation in conscious awareness; experience and expression in the context of the therapeutic relationship) of inhibited emotional responses (Alexander & French, 1946; Brenner, 1982; Levy, 1990).

Recently, others have cast emotional inhibition in a more positive light, arguing that this and other forms of emotion regulation represent an essential developmental milestone (Kopp, 1989; Saarni, 1990; Thompson, 1991). This view is consistent with the notion that healthy adults often must inhibit (to varying degrees) their ongoing emotion-expressive behavior (Tomkins, 1984). It also accords well with the evidence concerning the potent destructive effects of unregulated emotional responding, as in the precipitous expression of anger in intermittent explosive disorder. On this view, emotional inhibition is not uniformly pathogenic. Indeed, in many circumstances, it may be the failure of emotional inhibition that is problematic.

Obviously, there is a middle ground between these two perspectives, one that holds that there is an optimal level of emotional regulation—somewhere between total strangulation and completely unfettered expression. The point we wish to emphasize here, however, is the extremely important role that emotional inhibition has played historically in clinical theory.

Empirical Findings

Despite long-standing clinical interest in the topic of emotional inhibition, the relevant empirical literature is impoverished and inconsistent (for a review, see Gross & Levenson, 1993). Even if we limit ourselves to questions about the inhibition of emotion-expressive behavior (as opposed to the inhibition of subjective emotional experience), clear conclusions are difficult to come by. What little is known, though, suggests that inhibiting expressive behavior decreases self-reported experience of some emotions (e.g., pain, pride, and amusement) but not others (e.g., disgust; Bush, Barr, McHugo, & Lanzetta, 1989; Colby, Lanzetta, & Kleck, 1977; Gross & Levenson, 1993; Lanzetta, Cartwright-Smith, & Kleck, 1976; Leventhal & Mace, 1970; McCanne & Anderson, 1987; Stepper & Strack, 1993; Strack, Martin, & Stepper, 1988). Physiologically, inhibiting expressive behavior while waiting for a painful shock leads to decreased skin conductance reactivity (Colby et al., 1977; Lanzetta et al., 1976), but the effects of inhibiting emotional responses to other negative stimuli have been mixed (Gross & Levenson, 1993; Zuckerman, Klorman, Larrance, & Spiegel, 1981).

The Present Study

Inasmuch as mental health requires that we regulate powerful emotional impulses—and deficiencies in this ability are implicated in a wide variety of clinical conditions—it is unfortunate that more definitive statements about emotional inhibition cannot currently be made. To better understand the nature and consequences of this important emotion-regulatory process, we experimentally manipulated the inhibition of emotional responding in a sample of healthy volunteers using a similar methodology to the one we used previously to study disgust (Gross & Levenson, 1993). This time, however, we examined both a negative emotion (sadness) and a positive emotion (amusement), as well as a control neutral emotional state.

Our decision to study healthy participants was dictated by a desire to establish normative data relevant to this form of emotion regulation before engaging the complexities of clinical samples. Our selection of target emotions was dictated by the desire to extend our previous study of the negative emotion of disgust to a more clinically relevant negative emotion (sadness), whose regulation is centrally implicated in mood disorders such as major depressive disorder. Given the theoretical importance attached to distinctions between negative and positive emotions, we also wished to include a positive emotion (amusement) that also must at times be suppressed (e.g., to facilitate task focus). In addition, to address the possibility that the observed pattern of findings might result from inhibiting any behavior (rather than emotional inhibition per se), we included a control condition in which participants were instructed to inhibit their expressive behavior while in a neutral emotional state.

Hypotheses

We view emotional inhibition as an active, effortful affair in which inhibitory processes are recruited and then pitted against ongoing emotional responses. This leads to the prediction that some signs of emotion may be visible even as higher order inhibitory processes are activated. In addition, if emotional inhibition requires effort, it should have physiological consequences. This leads to the prediction that participants who inhibit ongoing emotion-expressive behavior should show greater signs of physiological activation that participants who do not engage in emotional inhibition. Finally, given the marked behavioral and physiological changes we anticipated would be wrought by emotional inhibition, it seemed possible that subjective experience also might be affected. Drawing on previous research, we predicted that emotional inhibition would lead to decreased amusement self-reports.

Method

Participants

One hundred and eighty female undergraduates participated in individual experimental sessions in order to fulfill a requirement of an introductory psychology course.[2]

Film Stimuli

Four films from a set of standardized emotional film stimuli (Gross & Levenson, 1995) were used. The first (1.5 min, soundless) shows flowers in a park (Ekman, Friesen, & O'Sullivan, 1988) and elicits emotion reports that are similar to baseline. The second film (3.5 min, with sound) shows a comedy routine (amusement film: Morra, Brezner, & Gowers, 1986). This film elicits emotion reports of amusement with little other emotion. The third film (3.5 min, soundless) shows a geometric display (neutral film: ScreenPeace screensaver). It elicits a relatively

[2] Two additional participants were tested but had to be excluded due to equipment failure (one in each experimental condition).

neutral emotional state characterized by limited emotional responding. The fourth film (3.5 min, with sound) shows a funeral scene with a distraught mother (sadness film: Stark & Ross, 1989). This film elicits emotion reports of sadness with little other emotion.

Procedure

On arrival, participants were informed that we were "interested in learning more about emotion" and that their reactions would be videotaped. Participants then watched four films. Prior to each film, participants rated their current emotional state (prefilm rating) and then sat quietly for a minute (resting baseline). Participants first watched the film of flowers in a park (to accustom them to the laboratory). Participants then saw amusement, neutral, and sadness films (the order of Films 2–4 was counterbalanced, and all participants saw all three films). The instructions participants received prior to the second, third, and fourth films were determined by their random assignment to one of two conditions (no suppression, suppression). In the no-suppression condition, participants received the following instructions:

> We will now be showing you a short film clip. It is important to us that you watch the film clip carefully, but if you find the film too distressing, just say "stop".

In the suppression condition, participants received the following instructions:

> We will now be showing you a short film clip. It is important to us that you watch the film clip carefully, but if you find the film too distressing, just say "stop." This time, if you have any feelings as you watch the film clip, please try your best not to let those feelings show. In other words, as you watch the film clip, try to behave in such a way that a person watching you would not know you were feeling anything. Watch the film clip carefully, but please try to behave so that someone watching you would not know that you are feeling anything at all.

Each film was followed by a 1-min postfilm period. After this postfilm period, participants completed a self-report inventory to describe their emotional responses during the film.

Apparatus

Audiovisual. A color video camera placed behind darkened glass in a bookshelf was used to record participants' facial behavior and upper body movement unobtrusively.

Self-report. Participants rated how they felt before each film (prefilm rating) and, after viewing each film, how they had felt during the film (film rating). On each occasion, participants used a self-report inventory consisting of 16 emotion terms (amusement, anger, arousal, confusion, contempt, contentment, disgust, embarrassment, fear, happiness, interest, pain, relief, sadness, surprise, tension) and 2 global terms (pleasantness, intensity). For the 16 emotion terms, participants rated the greatest amount of each emotion they felt using an anchored 9-point Likert scale (0 = *none*, 8 = *most in my life*) that was adapted from Ekman, Friesen, and Ancoli, 1980. For the global terms, participants rated their feelings on 9-point Likert scales (−4 = *extremely mild/unpleasant*, 4 = *extremely intense/pleasant*).

Physiological. Continuous recordings were made using a 12-channel Grass Model 7 (Astro-Med, Inc., West Warwick, RI) polygraph. Nine measures were obtained: (a) cardiac interbeat interval; (b) skin conductance level; (c) finger temperature; (d) finger pulse amplitude; (e) pulse transit time to the finger; (f) pulse transit time to the ear; (g) respiratory period; (h) respiratory depth; and (i) general somatic activity. These measures were selected so as to provide a broad index of the activity of the physiological systems (i.e., cardiac, vascular, somatic, respiratory, thermoregulatory) especially important to emotional responding.

Data Reduction

The first film (flowers in a park) was included solely to accustom participants to the laboratory; data from this film were not analyzed. For the amusement, neutral, and sadness films, data reduction for behavioral data was based on the prefilm (1 min) and film (3.5 min) periods. Data reduction for physiological data was based on the prefilm (1 min), instructional (1 min), and film (3.5 min) periods.

Behavior. Participants' behavioral responses were coded by four raters (2 men, 2 women) who were blind to participants' experimental conditions and to the nature of the film stimuli. Raters used a behavioral coding system that included 12 codes (Gross & Levenson, 1993): (a) happiness; (b) sadness; (c) pleasantness; (d) intensity; (e) body movement; (f) facial movement; (g) mouth movement; (h) yawning; (i) smiling; (j) crying; (k) blinks; and (l) face touching. Three of these were frequency measures (yawning, smiling, blinks; these were converted to events per minute for analysis), and the rest were continuous measures whose values were determined by the intensity, duration, and frequency of response. Reliabilities (derived by considering the average correlations among all possible comparisons among the four coders) were good (mean Pearson $r = .81$; range, $r = .64$ for sadness to $r = .96$ for smiling). Because each participant's behavioral responses were independently coded by two coders, final values for each of the codes were determined by averaging each of the coder's ratings for a given participant's expressive behavior. Change scores were then created for each variable by subtracting prefilm ratings from film ratings.

Physiology. For somatic activity, interbeat interval, and skin conductance level, change scores were created by subtracting prefilm period scores from film period scores for each variable. Then, to reduce the total number of physiological variables in the analysis, we created on a priori grounds two additional composite variables, which were designed to assess theoretically defined patterns of activation. The first was a measure of sympathetic activation of the cardiovascular system (excluding heart rate, which is a joint function of both sympathetic and parasympathetic activation). This measure was derived by combining four unit-weighted standardized change scores (pulse transit time to the finger, finger pulse amplitude, pulse transit time to the ear, and finger temperature). The second composite was a measure of respiratory activation, formed using two unit-weighted standardized change scores (respiratory period and respiratory depth).

Results

To assess the effects of emotional inhibition, we first consider the physiological effects of simply hearing the instructions to suppress (prior to the start of the film stimulus). Next, we examine the impact of emotional suppression (after the start of the film stimulus) on participants' physiological, behavioral, and subjective emotional responses.

Instructional Period

During the instructional period, all participants knew they would soon be seeing a film (they had no way of knowing which film), and half of the participants knew they would be trying to suppress their responses to the film. During this instructional period we measured physiological responses (no self-reports were obtained and no behavioral coding was done).

To evaluate the effects of the suppression instructions during this instructional period, we simply conducted an overall 2 level multivariate analysis of variance (MANOVA; Condition; sup-

Table 1
Mean Change in Physiological Response and Standard Error of the Mean During the Instructional Period for No-Suppression and Suppression Participants

	Instructional group					
	No suppression		Suppression			
Measure	*M*	*SE*	*M*	*SE*	*t*(179)	*p*
Somatic activity	0.03	0.01	0.06	0.01	2.95	.004
Cardiac interbeat interval	−11.23	2.39	−19.71	2.79	2.31	.02
Skin conductance level	−0.22	0.04	0.09	0.06	4.74	<.001
Cardiovascular activation	−0.17	0.02	−0.09	0.02	2.54	.01
Respiratory activation	−0.11	0.04	0.05	0.04	3.10	.002

pression, no suppression) with all five physiological variables. As we expected, there was an effect for condition, $F(5, 167) = 6.38$, $p < .001$. To understand this multivariate effect, we conducted two-level analyses of variance (ANOVAs; Condition; suppression, no suppression) for each of the five physiological variables (averaging over the three levels of emotion). As presented in Table 1, compared with their no-suppression counterparts, suppression participants showed greater increases in somatic activity, greater decreases in cardiac interbeat interval (signifying faster heart rates), greater increases in skin conductance, greater relative sympathetic activation of the cardiovascular system, and greater relative respiratory activation.

Film Period

During the film period, participants differed as to which instructions they received and which film they viewed. During this period, we coded expressive behavior and measured physiological responses. Subjective emotional experience was assessed following the film.

Expressive behavior. An overall 2 × 3 (Condition [suppression, no suppression] × Emotion [amusement, neutral, sadness]) MANOVA with all 12 behavioral variables revealed effects for condition, $F(12, 163) = 15.49$, $p < .001$, and Condition × Emotion, $F(24, 151) = 6.48$, $p < .001$. This indicated that the suppression instructions had an overall effect on participants' behavioral responses and that this effect varied as a function of film condition. To understand the effects of the suppression instructions on participants' expressive behavior during the films, we conducted 2 × 3 ANOVAs (Condition [suppression, no suppression] × Emotion [amusement, neutral, sadness]) for each of the behavioral measures. As presented in Table 2, these analyses revealed Condition × Emotion interactions for 11 of the 12 variables. Follow-up univariate tests revealed that the suppression instructions generally led participants to inhibit the specific expressive behaviors generated by each of the films.

Physiology. An overall 2 × 3 Condition ([suppression, no suppression] × Emotion [amusement, neutral, sadness]) MANOVA with all five physiological variables showed effects both for condition, $F(5, 167) = 4.43$, $p = .001$, and Condition ×

Table 2
Mean Change in Expressive Behavior and Standard Error of the Mean During the Three Film Periods for No-Suppression and Suppression Participants

	Amusement				Neutral				Sadness					
	No suppression		Suppression		No suppression		Suppression		No suppression		Suppression			
Measure	*M*	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*	C × E[a]	*p*
Happiness	4.62	0.11[b]	2.29	0.21[b]	0.21	0.07[b]	0.04	0.04[b]	0.76	0.13[b]	0.26	0.08[b]	39.55	<.001
Sadness	0.06	0.03[b]	0.27	0.09[b]	0.50	0.09	0.65	0.08	1.96	0.19[b]	1.23	0.14[b]	6.92	.001
Pleasantness	1.43	0.05[b]	0.67	0.08[b]	−0.32	0.05	−0.31	0.04	−0.57	0.08	−0.43	0.06	28.81	<.001
Intensity	4.02	0.11[b]	2.14	0.17[b]	0.93	0.10	0.68	0.08	2.02	0.17[b]	1.14	0.13[b]	25.82	<.001
Body movement	1.52	0.17[b]	0.52	0.18[b]	0.52	0.19[b]	0.13	0.16[b]	−0.17	0.18	−0.12	0.15	5.91	=.003
Face touching	1.11	0.21	0.39	0.21	0.37	0.29	0.16	0.20	0.29	0.26	0.21	0.19	1.23	*ns*
Face movement	2.74	0.14[b]	1.32	0.16[b]	0.82	0.11[b]	0.29	0.11[b]	1.03	0.16[b]	0.56	0.10[b]	9.07	<.001
Mouth movement	3.21	0.18[b]	1.59	0.21[b]	0.91	0.17	−0.02	0.15	0.47	0.19	0.34	0.15	11.94	<.001
Yawning	−0.17	0.04	−0.11	0.03	−0.12	0.04	−0.09	0.03	−0.26	0.05[b]	−0.07	0.03[b]	3.15	.045
Smiling	4.81	0.22[b]	1.39	0.19[b]	0.03	0.06	−0.07	0.04	0.21	0.06[b]	−0.03	0.04[b]	62.31	<.001
Crying	0.00	0.00	0.07	0.05	−0.02	0.06	0.02	0.01	0.92	0.19[b]	0.38	0.12[b]	3.42	.033
Blinks	3.49	1.25	6.79	1.34	1.17	1.15	0.34	1.24	5.62	1.44	4.66	1.30	3.47	.033

Note. C = condition; E = emotion.
[a] *dfs* = 2, 177. [b] Mean difference (between instructional groups within a given film) is significant at $p < .05$.

Emotion, $F(10, 162) = 5.35$, $p < .001$. To understand this Condition × Emotion interaction, we used univariate 2 × 3 Condition ([suppression, no suppression] × Emotion [amusement, neutral, sadness]) ANOVAs for each of the physiological variables. These analyses revealed Condition × Emotion interactions for somatic activity, $F(2, 174) = 18.32, p < .001$, interbeat interval $F(2, 177) = 4.25$, $p = .016$, and sympathetic activation of the cardiovascular system, $F(2, 176) = 3.79$, $p = .024$, with a marginal interaction for respiratory activation, $F(2, 175) = 2.59$, $p = .078$. Because this top-down approach did not allow us to test fully whether the suppression instructions led to increased skin conductance levels in the emotional films but not the neutral film, we supplemented this approach with three additional t tests that assessed whether the suppression instructions affected skin conductance during the three films.

As presented in Figure 1, follow-up tests revealed that the suppression instructions had physiological consequences during the amusement and sadness films, but not during the neutral film. During the amusement film, suppression participants showed lesser somatic activity and slower heart rates, but greater sympathetic activation of the cardiovascular system than no-suppression participants; mean change in somatic activity: suppression = 0.02, no suppression = 0.13, $t(148.80) = 4.92$, $p < .001$; mean change in interbeat interval: suppression = 21.94, no suppression = −1.49, $t(178) = 3.45$, $p = .001$; mean change in sympathetic activation of the cardiovascular system: suppression = 0.43, no suppression = 0.11; $t(177) = 3.60$, $p < .001$. During the sadness film, suppression participants showed lesser somatic activity, greater skin conductance, greater sympathetic activation of the cardiovascular system, and greater respiratory activation than their no-suppression counterparts; mean change in somatic activity: suppression = −0.03, no suppression = −0.07, $t(147.83) = 2.78$, $p = .006$; mean change in skin conductance: suppression = −.01, no suppression = −.26, $t(177) = 1.97$, $p = .05$; mean change in sympathetic activation of the cardiovascular system: suppression = 0.30, no suppression = 0.13, $t(177) = 2.00$, $p = .047$; mean change in respiratory activation: suppression = 0.13, no suppression = −0.10, $t(177) = 2.27$, $p = .024$.

Subjective experience. The overall MANOVA for the self-report variables revealed neither condition, $F(18, 133) = 1.19$, *ns*, nor Condition × Emotion, $F(36, 115) = 0.16$, *ns*, effects, indicating that the suppression instructions had no overall effect on participants' emotion self-reports. This was consistent with our prediction that the effects of the suppression manipulation in the self-report domain would be specific (as contrasted with the more general effects expected in the domains of behavior and physiology).

Because there was no evidence of any multivariate effects involving condition, we did not proceed with follow-up univariate tests for each of the 18 self-report variables. However, we did conduct specific planned comparisons to test the a priori hypotheses that suppression participants would report less amusement than no suppression participants during the amusement film (but not during the sadness and neutral films), and that there would be no difference in self-reported sadness be-

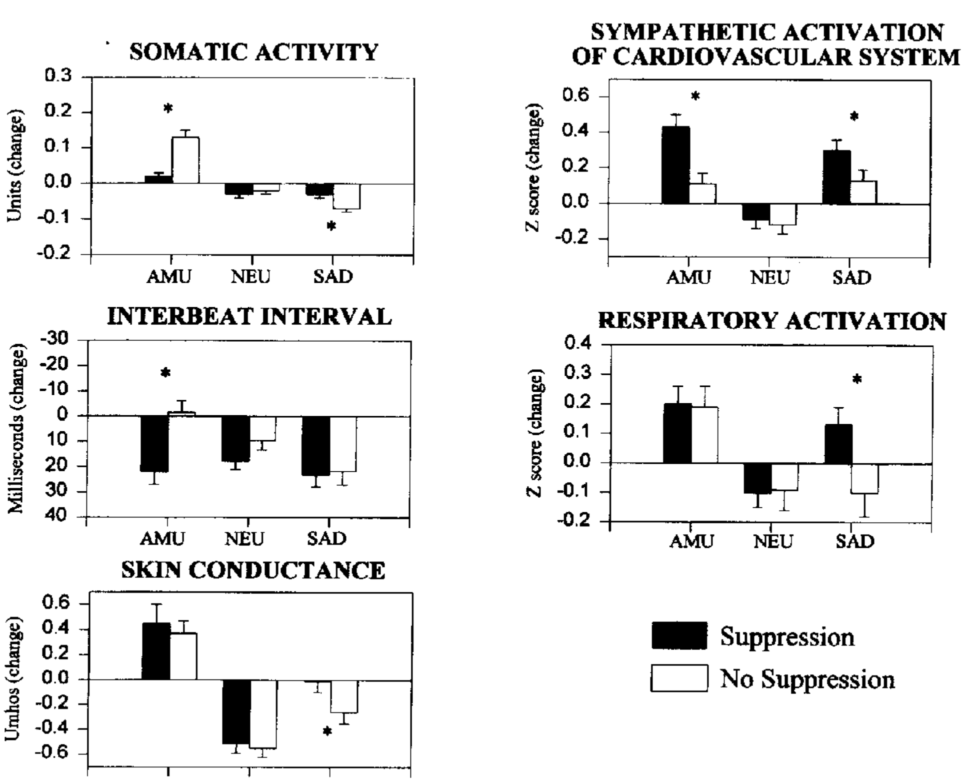

Figure 1. Mean change in physiological responding during amusement (AMU), neutral (NEU), and sadness (SAD) films; asterisks indicate that means differ significantly ($p < .05$).

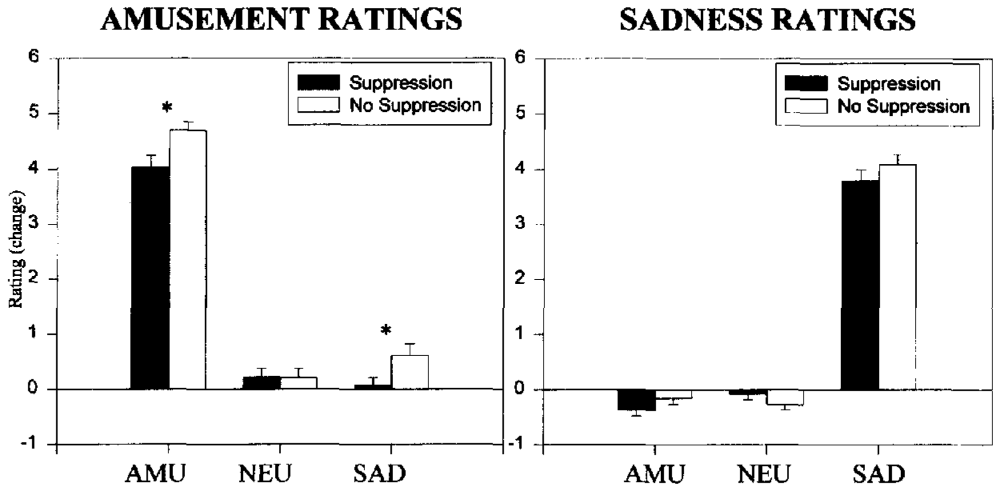

Figure 2. Mean change in amusement and sadness self-reports during amusement (AMU), neutral (NEU), and sadness (SAD) films; asterisks indicate that means differ significantly ($p < .05$).

tween instructional groups for any of the three film conditions. As presented in Figure 2, between-groups t tests comparing change in amusement for the suppression and no-suppression participants revealed that suppression participants reported less amusement than no-suppression participants during the amusement film and during the sadness film, but not during the neutral film; mean change in amusement during amusement film: suppression = 4.04, no suppression = 4.70, $t(178) = -2.50$, $p = .013$; mean change in amusement during sadness film: suppression = 0.07, no suppression = 0.61, $t(156.37) = -2.13$, $p = .034$; mean change in amusement during neutral film: suppression = 0.22, no suppression = 0.21, $t(178) = 0.05$, *ns*. Comparable tests for sadness self-reports showed no difference between instructional groups for any of the three film conditions; mean change in sadness during amusement film: suppression = −0.37, no suppression = −0.16, $t(178) = 1.37$, *ns*; mean change in sadness during sadness film: suppression = 3.79, no suppression = 4.09, $t(177) = -1.07$, *ns*; mean change in sadness during neutral film: suppression = −.08, no suppression = −.27, $t(178) = 1.35$, *ns*.

Discussion

To begin to chart the consequences of one important form of emotion regulation, we asked participants either to suppress their behavioral responses or to respond naturally while in negative, neutral, or positive emotional states. In the following sections, we review our findings and offer several suggestions as to how emotional inhibition might promote—or impair—psychological functioning.

Effects of Preparing to Suppress

The initial effects of emotional inhibition were evident during the instructional period, even before participants were exposed to the emotion-eliciting stimulus. During this period, participants who were told that they would soon have to try to inhibit their emotion-expressive behavior evidenced widespread physiological activation compared with those who were not told they would need to control their reactions. These signs of greater physiological activation are most likely the autonomic and somatic concomitants of a generalized preparatory mechanism for emotion suppression. We believe this preparation can best be described as participants' "bracing" themselves in anticipation of what was to come, reflecting both their uncertainty about the upcoming emotional experience and their concern about whether they would be able to perform the assigned task of inhibiting all visible signs of emotion.

Effects of Suppression

We conceptualize emotions as powerful biologically based reactions that organize our responses to environmental challenges and opportunities (Levenson, 1994). This leads to the prediction that overriding emotion response tendencies requires an active inhibitory process (Gross & Levenson, 1993). Given the integration of behavior, physiology, and subjective experience in emotion, we expected emotional inhibition to have important consequences for behavior, physiology, and subjective experience.

Expressive behavior. While viewing emotional stimuli that ordinarily produce strong emotion-expressive behaviors, suppression participants were able to decrease dramatically (but not eliminate) their expressive behavior. This points to an impressive ability in these college-aged participants, an ability that spans both positive and negative emotions. The fact that this inhibition was not complete gives credence to the view that emotions may be controlled, but only to a point (Gross & Muñoz, 1995).[3] It is interesting to note that some participants

[3] Suppression participants were rated as showing more sadness expressive behavior than their no-suppression counterparts during the amusement film. This may be due to suppression participants' engaging the muscles that turn down the lip corners (the same muscles that are naturally activated in sadness) in order to inhibit the upturning of the lip corners associated with amusement.

appeared to be able to inhibit their expressive behavior more completely than others. What determines how well someone is able to hide what he or she feels? Are people who are good at emotional inhibition those who typically express little emotion in their day-to-day lives (Gross & John, 1997)? Or are they people who use their ability to inhibit emotion in particular circumstances? Given the purported role of compromised emotion regulatory mechanisms in psychopathology, it is important to study emotional inhibition in clinical samples and to see if clinical improvement, whether brought about by treatment or by time, is accompanied by normalization of the kinds of emotional regulatory processes documented here.

Physiology. Because we thought it was the suppression of emotional expressive behavior that led to the physiological changes found previously (Gross & Levenson, 1993), we expected that inhibiting nonemotional behavior would not produce physiological activation. Indeed, during the neutral film, which produced very low levels of self-reported emotion (and predominantly nonemotional expressive behavior such as lip biting and yawning), no differences were found between no-suppression and suppression participants for any of the physiological variables. This suggests that the physiological impact of emotional suppression grows out of the counterpoising of attempts to inhibit expression against strong impulses to express. Absent a stimulus that produces such impulses to express, inhibition of ongoing behavior apparently has little physiological impact.

When emotional expression was inhibited, however, the impact was clear. This included decreases in whatever facial and somatic behavior was associated with the emotional stimulus. Thus, the amusement film by itself produced increases in smiling and increases in somatic activity. When participants attempted to suppress their responses to this film, they manifested lesser increases in smiling and lesser increases in somatic activity. Similarly, the sadness film by itself produced increases in sad expressions and decreases in somatic activity. Attempts to suppress responses to this film resulted in lesser increases in sad expressions and lesser decreases in somatic activity. As in Gross and Levenson (1993), heart rate generally followed somatic activity, a finding in keeping with the close relationship between cardiac and somatic activity (Obrist, 1981).[4] Whereas the foregoing findings showed some specificity to the emotion elicited, the most striking feature of emotional suppression common to all emotions we have studied thus far (both sadness and amusement in the present study and disgust in our previous studies) is the enhanced sympathetic activation of the cardiovascular system. This suggests that suppression of both positive and negative emotions exacts a palpable physiological cost, particularly when one keeps in mind that this sympathetic activation of the cardiovascular system occurs despite decreased metabolic demands caused by the decrement in manifest expressive behavior.[5]

One question that we cannot answer is whether the physiological activation associated with emotional suppression is different in type or amount from that brought about by other forms of emotion regulation (e.g., amplification, Zuckerman et al., 1981; repression, Brown et al., 1996) or by other forms of inhibition altogether (e.g., suppression of pain sensations, Cioffi & Holloway, 1993; thought suppression, Roemer & Borkovec, 1994; Wegner, 1994). Fowles's (1980) three arousal model suggests that diverse forms of inhibition may share certain features, but we expect there are both similarities and dissimilarities among the inhibition of emotional expressive behavior, other forms of emotion regulation, and still other types of mental work. We believe this issue clearly bears further study.[6]

Subjective experience. Despite the substantial effects of emotional suppression in the domains of expressive behavior and physiological responding, this manipulation had only a modest impact on participants' self-reported emotional experience. In keeping with previous findings, suppression participants reported lesser increases in amusement than no-suppression participants during the amusement film. Our other finding in this domain, that suppression participants reported lesser amusement than no-suppression participants during the sadness film, was initially puzzling. However, it may underscore the closeness of the relationship between emotional expression and emotional experience in amusement. Even though the sadness film primarily produced sadness expressive behavior, it also produced low levels of amusement expressive behavior (see Table 2), and the suppression instructions led to decreased levels of amusement expressive behavior and smiling during this film. Thus, our findings suggest that whenever amusement expressive behavior is curtailed (regardless of what the predominant emotion is), there is a corresponding decrease in the subjective experience of amusement.[7]

[4] When somatic activity was used as a covariate, there was no longer a reliable difference in heart rate between suppression and no-suppression groups during the amusement film, $F(1, 174) = 1.38$, $p = .24$.

[5] Because the films elicited expressive behavior that differed both in amount and kind, strong statements about emotion-specific effects of suppression cannot be made. However, some evidence for qualitative rather than quantitative effects is available if we use the difference between mean behavioral intensity ratings of no-suppression participants and suppression participants as an estimate of the degree of emotional suppression in each film condition. A simple quantitative hypothesis would predict that the effects of suppressing amusement (difference in mean ratings of behavioral intensity for no-suppression and suppression participants = 1.88) should be much greater than the effects of suppressing sadness (differences in mean ratings of behavioral intensity = 0.88), but this is clearly not so.

[6] One puzzle is why our physiological findings are at odds with those of some previous workers. One explanation is methodological. For example, Zuckerman and coworkers (1981) found that participants in the suppression condition generally showed less physiological arousal than participants in the spontaneous condition, but their analyses were conducted using a composite measure of physiological arousal that commingles sympathetic and parasympathetic activation, and they collapsed across positive and negative film conditions. Because suppression appears to have different effects on sympathetic and parasympathetic measures, and in positive versus negative emotional states, it may be that methodological factors are responsible for reported differences in findings. Other differences may be more substantive. For example, Lanzetta and colleagues (1976) found that inhibiting one's expressive behavior while waiting for a painful shock decreased physiological responding. This study differed from ours both in the induction procedure and in the induced state, and it is not clear which difference is responsible for the discrepant findings. One possibility, however, is that pain is best conceptualized as a nonemotional state, in which case this study would provide further evidence that concealing nonemotional behaviors (such as gross motor activity associated with pain) does not produce the physiological tug of war associated with the increased physiological activation observed in the present study.

[7] This point is reinforced by the results of secondary analyses that indicated that the effects of the suppression instructions during the amusement film were so specific that even happiness and contentment self-reports were unaffected.

Why might suppression decrease subjective emotional experience for a positive emotion such as amusement but not for negative emotions such as sadness or disgust? One explanation stems from the observation that people seem to control negative emotions more frequently than positive emotions (Wallbott & Scherer, 1989). If this is so, adults would have had many more experiences of disjunctions between emotional experience and emotional expression for negative emotions than for positive emotions. Conceivably, this might lead them to rely less heavily on their expressive behavior when judging their own emotional experience for negative emotions than for positive emotions.

Emotional Inhibition and Mental Health

Our findings suggest that for negative emotions such as sadness, inhibiting emotional expressive behavior does not provide relief from the subjective experience of that emotion. Thus, as a route to the alleviation of negative feelings, hiding one's emotions is unlikely to help one feel better. Of course, this does not mean that restraining emotional impulses (e.g., to yell or to hit) is never desirable. It is in fact easy to imagine circumstances under which it is better for one's own (and others') psychological health and general welfare to curtail one's expressive behavior. For example, decreasing displays of depressive affect may increase the likelihood of receiving succorance (Coyne, 1976), and interrupting strings of reciprocal negative affective displays may improve marital interaction (Levenson & Gottman, 1983). For a variety of reasons, there may be times when it is vital to dissociate the emotions we feel from the behavior we express (Gross & Muñoz, 1995).

Under other circumstances, however, emotional suppression may interfere with successful adjustment. Particularly when emotional inhibition is chronic, inflexible, and insensitive to the nuances of the social environment, it may impair the efficiency of cognitive processing, it may block adaptive action, and it may limit the ability of our social partners to accurately track (and thus respond appropriately to) our needs and plans. In the next two sections, we discuss each of these potential implications of emotional inhibition.

Emotional inhibition and cognitive performance. Emotional inhibition leads to widespread increases in sympathetic activation. Such heightened physiological activation has been shown to lead to impaired sensory intake and sensorimotor integration (Lacey & Lacey, 1979). This suggests that emotional inhibition might diminish cognitive performance. A resource allocation perspective makes a similar prediction. If cognitive capacity is finite, and the inhibition of ongoing emotion–expressive behavior can be viewed as a task that requires cognitive resources, this additional task might decrease cognitive performance. Although we know of no study directly assessing the cognitive consequences of emotional inhibition, indirect evidence comes from a study of behavioral inhibition by Gilbert, Krull, and Pelham (1988). These researchers found that participants who were asked to regulate their gaze to avoid looking at certain words drew more incorrect dispositional inferences about a target than did participants not asked to regulate their gaze. The findings were interpreted as suggesting that "individuals may spend so much effort regulating their gaze that they are unable to perform the resource-limited operations that accurate social inference requires" (Gilbert et al., 1988, p. 688). Although it is a sizable step from gaze inhibition to emotion inhibition, this finding encourages speculation that emotion inhibition (and perhaps other forms of emotion regulation) also might decrease cognitive performance. If this speculation is borne out, this may shed light on the performance decrements associated with mood and anxiety disorders, perhaps caused in part by the cognitive costs of ongoing attempts at emotion regulation.

Emotional inhibition, behavior, and social interaction. Because emotions comprise integrated packages of response tendencies designed to coordinate adaptive behavior in the face of challenge (Levenson, 1994; Tooby & Cosmides, 1990), habitually and inflexibly overriding these responses may compromise an individual's ability to manage these challenges successfully. Thus, if one is disgusted by what one is eating but inhibits the food-expulsive behaviors associated with disgust, the resultant continuation of eating increases the risk for illness. If the tendency to withdraw from a dangerous situation that is part of fear is inhibited, one may take unwelcome risks. If the anger occasioned by mistreatment by another person is hidden, one's treatment is unlikely to improve.

The last example highlights an essential function of emotion-expressive behavior, namely the communication of our emotional states to others, thereby influencing their behavior. Such nonverbal information flow is essential for successful interpersonal functioning. As theorists since Darwin (1872) have noted, we rely on our social partners' emotional expressions to give us information about their needs and preferences. For example, if we inadvertently anger someone, their angry expression signals the effect of our behavior and lets us know that we should engage in corrective behaviors (e.g., apologizing). However, if the person we have angered systematically suppresses emotion-expressive behavior, we are less likely to be aware of the problem and therefore less likely to change what we are doing. In this case, the person who is doing the suppressing may continue to have strong negative emotional responses—perhaps at even greater intensity levels and with ever-increasing frequency because the unsignaled emotions do not engender corrective behaviors on the part of others. Indeed, this may be one important element of the emotional miscommunication evident in so many forms of psychopathology.

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