



# Effects of suppression and acceptance on emotional responses of individuals with anxiety and mood disorders

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## Abstract

The present investigation compared the subjective and physiological effects of emotional suppression and acceptance in a sample of individuals with anxiety and mood disorders. Sixty participants diagnosed with anxiety and mood disorders were randomly assigned to one of two groups. One group listened to a rationale for suppressing emotions, and the other group listened to a rationale for accepting emotions. Participants then watched an emotion-provoking film and applied the instructions. Subjective distress, heart rate, skin conductance level, and respiratory sinus arrhythmia were measured before, during, and after the film. Although both groups reported similar levels of subjective distress during the film, the acceptance group displayed less negative affect during the post-film recovery period. Furthermore, the suppression group showed increased heart rate and the acceptance group decreased heart rate in response to the film. There were no differences between the two groups in skin conductance or respiratory sinus arrhythmia. These findings are discussed in the context of the existing body of research on emotion regulation and current treatment approaches for anxiety and mood disorders.

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## Introduction

Successful regulation of emotional states is important for social adjustment and overall well-being. Pursuing important life goals requires tolerance and management of a wide range of emotional states, some of which can be uncomfortable (e.g., anxiety about a first date or job interview). Unsuccessful regulation of emotions can impede individuals in pursuing their goals and maintaining desired life circumstances. Moreover, individuals who fail to develop flexible and effective emotion regulation skills may experience excessive and persistent emotions that interfere with their sense of well-being. Anxiety and mood disorders are partly characterized by excessive and persistent negative emotions, suggesting that ineffective regulation of emotion

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may play a role in their development or maintenance. Research on the subjective, physiological, and behavioral consequences of emotion regulation strategies therefore has crucial relevance to these disorders.

Despite the importance of understanding emotion regulation in individuals suffering from anxiety and mood disorders, the vast majority of extant research on emotion regulation has been conducted with non-clinical samples. These studies have produced several results that have potential implications for understanding pathological anxiety and depression. For example, habitual use of suppression to manage emotional experience has been associated with a range of negative outcomes including higher levels of negative affect, lower levels of positive affect, poorer social adjustment, and decreased well-being (Gross & John, 2003). Experimental investigations also have shown that although individuals can successfully inhibit the outward expression of emotion, this strategy does not alleviate subjective experience of emotion (Gross, 1998; Gross & Levenson, 1997). Moreover, suppression of emotional expression has been shown to increase sympathetic arousal to a greater degree than comparison conditions (Gross, 1998). The counterproductive effects of suppression have been documented across a variety of emotions including amusement, sadness, and disgust (Gross, 1998; Gross & Levenson, 1997).

Emotion suppression has recently been studied in conjunction with the concept of “experiential avoidance,” which refers to unwillingness to experience negatively evaluated feelings, physical sensations, and thoughts (Hayes et al., 2004). Individuals who possess high levels of this trait commonly rely on suppression, avoidance, and other control tactics to manage emotional experiences. Experiential avoidance has been found to correlate with self-reported levels of anxiety and depression (Hayes et al., 2004), suggesting that it may be an important feature of some cases of emotional disorder. Recent empirical studies have shown that otherwise healthy individuals who score high on experiential avoidance respond with greater emotional distress and more negative cognitions to emotion-provoking procedures such as biological challenges (Feldner, Zvolensky, Eifert, & Spira, 2003; Karekla, Forsyth, & Kelly, 2004) and emotional film clips (Sloan, 2004). These findings suggest that a persistent pattern of emotional suppression may be associated with increased rather than decreased reactivity to emotion-provoking stimuli. One study further documented that instructing participants to suppress their emotions led to increased distress in individuals high on experiential avoidance, but not for individuals low on this trait (Feldner et al., 2003). This suggests that suppression is particularly counterproductive for experientially avoidant individuals who may also be prone to anxiety and depression (Hayes et al., 2004).

The evidence linking emotion suppression to increases in negative affect and sympathetic arousal can be placed in the larger context of the literature on suppression of other states (e.g., thoughts, pain). In a classic study that inspired numerous other investigations of thought suppression, Wegner, Schneider, Carter, and White (1987) demonstrated that attempts to suppress thoughts about a white bear paradoxically *increased* the frequency of such thoughts during a post-suppression period in which participants were free to think about any topic. Subsequent research has established links between this rebound effect as a laboratory phenomenon and clinical disorders. For example, the rebound effect has been documented in anxious and depressed individuals (Janeck & Calamari, 1999; Wenzlaff, Wegner, & Roper, 1988), and in participants who are trying to suppress personally relevant negative material (Salkovskis & Campbell, 1994; Trinder & Salkovskis, 1994). Moreover, thought suppression has been associated with increased electrodermal responses to emotional thoughts (Wegner & Gold, 1995; Wegner & Zanakos, 1994), suggesting that it elevates sympathetic arousal.

Evidence also exists that attempts to suppress pain are unproductive. Cioffi and Holloway (1993) exposed participants to a cold-pressor pain induction and assigned them to either focus on the sensations in their hands, distract themselves by thinking of their rooms at home, or suppress thoughts and feelings related to the pain. During the pain induction, the suppression group demonstrated greater increases in electrodermal activity than the other two groups. Moreover, after the pain induction ended, pain recovery was slowest in the suppression group. Participants in the suppression group also manifested increased heart rate relative to the other groups in anticipation of a second pain induction, and lower self-efficacy for withstanding the pain of the second induction.

The results of thought and pain suppression studies converge with the results of recent emotion suppression studies to suggest that suppression produces paradoxical increases in unwanted experience and arousal. The thought and pain suppression literatures also highlight additional avenues for study of emotion suppression. Importantly, these studies suggest that some of the most important effects of suppression may occur *after*

efforts to suppress have terminated. Increases in unwanted thoughts occur during a post-suppression period (e.g., Wegner et al., 1987), and pain continues for suppressors during a post-suppression recovery period (Cioffi & Holloway, 1993). Therefore, one objective of the present study is to examine the effects of emotional suppression that may persist after an emotion induction.

An approach that has been studied recently in conjunction with emotional suppression is emotional acceptance (e.g., Eifert & Heffner, 2003; Hayes, et al., 1999; Levitt, Brown, Orsillo, & Barlow, 2004). Acceptance-oriented approaches encourage individuals to experience their emotions, thoughts, and bodily sensations fully without trying to change, control, or avoid them (Hayes, Strosahl, & Wilson, 1999). Acceptance entails openness to internal experiences and willingness to remain in contact with those experiences even if they are uncomfortable. Acceptance is an apt comparison condition for emotional suppression because it involves welcoming all types of internal experience as opposed to pushing experiences away.

An additional rationale for studying acceptance is the growing clinical interest in this approach. Mindfulness and other acceptance-oriented strategies have been incorporated into a number of promising behavioral treatments for anxiety and depression (Hayes, Strosahl et al., 1999; Roemer & Orsillo, 2002; Segal, Williams, & Teasdale, 2002). Several recent studies suggest that this orientation to emotions promotes good outcomes in individuals with psychological disorders (Bach & Hayes, 2002; Hayes, Strosahl et al., 1999; Heffner, Eifert, Parker, Hernandez, & Sperry, 2003). Acceptance also predicts better adjustment and functioning in individuals with chronic pain (McCracken, 1998).

Despite the apparent therapeutic value of acceptance, more empirical research is needed to fully understand the effects of acceptance on the subjective, physiological, and behavioral aspects of the emotional response. Such research would aid in providing a solid empirical basis for acceptance-oriented therapies, and in elucidating their mechanisms of change. Hayes et al. (1999) suggested that laboratory inductions be utilized to provide this basis. In a preliminary study, they showed that participants who received an acceptance-oriented rationale prior to a cold-pressor task displayed greater pain tolerance than individuals who received suppression-oriented or placebo rationales. Subjective experience of pain did not differ across the conditions, even though the suppression-oriented rationale targeted this domain.

More recently, Eifert and Heffner (2003) compared the effects of acceptance and suppression rationales on responses of females high in anxiety sensitivity, a known risk factor for panic (e.g., Schmidt, Lerew, & Jackson, 1997). Prior to breathing carbon dioxide-enriched air, participants were exposed to acceptance-oriented instructions, suppression-oriented instructions, or no instructions. Participants randomly assigned to the acceptance group manifested less intense fear and less catastrophic thinking during the procedure than participants in the suppression and no instructions groups. They also demonstrated less behavioral avoidance, as evidenced by lower levels of termination of the experimental procedure and greater willingness to return for another session. Levitt and colleagues (2004) recently replicated this experiment with a sample of individuals diagnosed with panic disorder. They found similar benefits of acceptance in this clinical sample including decreased subjective distress during the challenge and increased willingness to undergo another symptom provocation.

In the current study, we sought to further explore the effects of suppression and acceptance in participants with anxiety and mood disorders. Participants were randomly assigned to listen to audiotapes encouraging them to either accept or suppress their emotional reactions. After participants heard the acceptance or suppression instructions, they applied these instructions while watching an emotion-provoking film. Subjective and physiological responses were measured before, during, and after the film.

For both acceptance and suppression groups, we expected the films to provoke increases in subjective distress and skin conductance (a measure of sympathetic activation), and decreases in respiratory sinus arrhythmia (a measure of parasympathetic activation). We also measured heart rate, which is an index of joint sympathetic and parasympathetic activation that may reflect somatic activity, mental effort, emotional arousal, and/or orientation to stimuli (Larsen, Schneiderman, & Pasin, 1986). Given the multiple determinants of heart rate, the impact of the film on this variable was less certain; however, numerous studies have shown that participants with anxiety disorders manifest increased heart rate in response to experimental stressors (e.g., Elsesser, Sartory, & Tackenberg, 2004; Hofmann, Newman, Ehlers, & Roth, 1995).

The effect of deliberate suppression on subjective distress during the film was uncertain, given that some studies have shown increased subjective distress associated with suppression during emotion provocation

(e.g., Feldner et al., 2003) and others have not (e.g., Gross, 1998). Our primary hypothesis regarding subjective distress was based on results from thought and pain suppression studies showing that suppression leads to poorer recovery from the undesired experience (e.g., Cioffi & Holloway, 1993; Wegner et al., 1987). We therefore predicted that individuals who suppressed their emotions would have more residual negative affect after the film than individuals who accepted their emotions.

Although some investigations have failed to find elevated sympathetic activation in individuals attempting to suppress emotions (Eifert & Heffner, 2003; Levitt et al., 2004), we predicted that suppression would be associated with increased sympathetic arousal given the similarity of our emotion-provoking stimuli to those used in other experiments that found this effect (Gross & Levenson, 1997; Gross, 1998). Evidence of increased sympathetic arousal in the suppression group was expected to be apparent in increased skin conductance levels and heart rate compared to the acceptance group. Finally, we speculated that suppression would be associated with decreased parasympathetic responding compared to acceptance, given that low vagal tone has been associated with other ineffective strategies for controlling arousal (i.e., worry; cf. Lyonfields, Borkovec, & Thayer, 1995).

## Method

### Participants

The sample consisted of 60 patients who presented for assessment at the Center for Anxiety and Related Disorders at Boston University. There were equal numbers of men and women who participated, and the average age was 35.33 (SD = 11.74, range = 18–63). Participants were largely Caucasian (88.3%), with smaller numbers of individuals identifying as Asian (6.7%), Hispanic (1.7%), and multi-racial (3.3%).

To be eligible for the study, patients had to be diagnosed with a current anxiety or mood disorder. In most cases, the anxiety or mood disorder was the principal or most severe diagnosis; however, participants could be included in the study if they had another type of principal diagnosis as long as they also had a current clinical anxiety or mood disorder. Diagnoses were established with the Anxiety Disorders Interview Schedule for *DSM-IV*: Lifetime version (ADIS-IV-L; Di Nardo, Brown, & Barlow, 1994). The most frequent current diagnoses endorsed by participants were: social phobia ( $n = 34$ ; 56.7%), major depressive disorder ( $n = 20$ ; 33.3%), generalized anxiety disorder ( $n = 19$ ; 31.7%), panic disorder with or without agoraphobia ( $n = 17$ ; 28.3%), specific phobia ( $n = 10$ ; 16.7%), obsessive-compulsive disorder ( $n = 10$ ; 16.7%), and dysthymic disorder ( $n = 8$ ; 13.3%). The rates of participants meeting criteria for one, two, three, four, and five current diagnoses were 20.2%, 22.5%, 16.9%, 6.7%, and 1.1%, respectively (i.e., most participants met criteria for multiple diagnoses).

Potential participants were excluded from the study if they had no current anxiety or mood disorder or if they were actively psychotic, suicidal, homicidal, or substance abusing. Participants were also excluded if they had prior exposure to traumatic events similar to those depicted in the experimental stimulus (e.g., combat, gun violence) or presence of a blood-injury-injection phobia that might cause fainting in response to the experimental stimulus. Of the 125 clinical participants who were eligible, 60 completed the study (48%). The most common reasons for declining participation were failure to return phone calls regarding the study ( $n = 22$ ), too busy to participate ( $n = 17$ ), and apprehension about some aspect of the study procedure (typically the uncertain content of the emotion-provoking films;  $n = 12$ ).

### Measures

#### ADIS-IV-L

The ADIS-IV-L (Di Nardo et al., 1994) is a semi-structured interview that assesses for *DSM-IV* anxiety, mood, somatoform, and substance use disorders, and screens for the presence of other conditions (e.g., psychotic disorders). Interviewers assign a 0–8 clinical severity rating (CSR) to each diagnosis recorded; a CSR of 4 or greater indicates a clinically significant diagnosis. A recent reliability study of individuals who had two independent administrations of the ADIS-IV-L indicated good to excellent interrater agreement for the majority of anxiety and mood disorders (Brown, Di Nardo, Lehman, & Campbell, 2001).

### *Positive and Negative Affect Scales: State Version (PANAS)*

The PANAS (Watson, Clark, & Tellegen, 1988) is a 20-item scale consisting of adjectives that describe mood states. For this study, the instructions asked participants to rate the degree to which they felt each emotion *currently*. Respondents rated each mood adjective on a 0–4 scale (0 = very slightly or not at all to 4 = extremely). The questionnaire is divided into two subscales of positive affect (PANAS-P; e.g., “excited,” “proud”) and negative affect (PANAS-N; e.g., “upset,” “hostile”). The PANAS-N subscale was used as a measure of subjective distress. The PANAS is widely used and has good reliability and validity (Mackinnon et al., 1999; Watson et al., 1988).

### *Psychophysiological measurement*

Psychophysiological measurement was accomplished with equipment and software designed by the James Long Company (JLC; Caroga Lake, NY) and with the data-acquisition program Snap-Master™ for Windows. The system allowed for continuous collection of physiological data in the cardiac, respiratory, and electrodermal domains. The physiological measures were digitized at 512 samples per second with a 31-channel A/D converter operating at a resolution of 12 bits and having an input range of  $-2.5$  to  $+2.5$  V. Amplification rates, high-pass filter (HPF), and low-pass filter (LPF) settings were as follows: electrocardiogram (ECG; gain = 500, HPF = 0.1 Hz, LPF = 1000 Hz), respiration (gain = individually adjusted, HPF = none/DC, LPF = 10 Hz), and skin conductance level (SCL; gain =  $0.1$  V/ $\mu$ S, HPF = none/DC, LPF = 10 Hz).

For the ECG, target skin areas were cleaned with alcohol wipes and allowed to dry. Disposable conductive adhesive electrodes were then placed on participants' lowest ribs. One was placed on the right side of the rib cage and the other on the left. Heart rate (HR) data were analyzed using the ECGRWAVE program by JLC. ECGRWAVE utilizes an algorithm to detect R-waves and potential artifacts. R-waves were automatically detected by the computer program and subsequently raw ECG and R-wave identification marks were viewed graphically by the experimenter. The R-wave file was manually corrected with a mouse to remove R-wave identification marks that were incorrectly specified (e.g., a movement artifact that the computer coded as an R-wave) or to score R-waves that were missed by the automated detection. HR was calculated as number of R-waves per minute.

Breathing rate and volume were measured with a respiration belt that was secured at the diaphragm. A JLC software program combined cardiac and respiratory data to estimate respiratory sinus arrhythmia (RSA). RSA refers to the rhythmic variations in heart rate that occur at the frequency of respiration, and reflects parasympathetic control over heart rate (Berntson, Cacioppo, & Quigley, 1993). The JLC software program computes RSA according to Grossman's (1983) recommendations. RSA was computed by calculating the difference between the minimum interbeat interval during inspiration and the maximum interbeat interval during expiration, and is reported in seconds.

Finally, skin conductance level (SCL) was measured using two Ag–AgCl electrodes filled with electroconductive gel that were attached to the palmar surface of the middle phalanges of the third and fourth fingers of the non-dominant hand. Participants washed their hands with soap and water before the electrodes were attached. SCL was averaged over 1 s intervals and reported in microsiemens. During the collection of physiological data, the onset and termination of periods of interest were defined using an event marker. Average values of HR, RSA, and SCL were computed for each period of interest (e.g., anticipation, exposure, recovery) using a computer program that was tailored for the purpose of this study.

### *Manipulation checks*

The first manipulation check was a 4-item, true/false questionnaire that tested participants' understanding of the instructions that were presented before the second film (e.g., “During the film, I should try to inhibit my emotions as much as possible;” the correct answer was “true” for the suppression group and “false” for the acceptance group). The second manipulation check tested whether one set of instructions was more difficult to enact than the other. This check consisted of one item presented after the second emotion induction: “How able were you to follow the audiotaped instructions during the film?” Participants rated their ability to follow the instructions on a 0–8 scale (0 = not at all able to, 8 = completely able). Finally, participants responded to



the question “I tried to hold back or suppress my emotional reactions” on a 0–8 scale (0 = not at all to, 8 = all the time). This rating allowed us to compare the degree of suppression used by members of the two groups.

### *Stimuli*

Film clips are a reliable method for eliciting emotions in the laboratory (e.g., Gross & Levenson, 1995; Hagemann et al., 1999; Philippot, 1993). Given that anxiety–spectrum emotions were most relevant to this clinical sample, a film clip was chosen that would elicit these target emotions. The stimulus presented during the current study was a 4.5-min clip from the movie “The Deer Hunter” in which captured soldiers were being forced to play “Russian Roulette.” Pilot testing in non-clinical participants confirmed that this film clip was very effective in provoking negative affect (mean PANAS-N scores = 19.30). The anxiety–spectrum emotions (e.g., “nervous,” “scared”) were the most commonly endorsed negative emotions except for terms referring to generalized distress (e.g., “upset,” “distressed”).

### *Procedure*

Written consent was obtained from all participants prior to the experimental session. Participants entered the laboratory where they sat in a reclining chair in front of a television. The experimenter (L.C-S.) attached the physiological recording equipment and explained the purpose of each device. Participants were informed that the experimenter would be in the adjacent room for the duration of the study, and that they would communicate via intercom.

Participants first completed a procedure for a study in which clinical participants were compared to control participants who had no history of anxiety or mood disorder. Data from this study are not presented here due to loss of a large amount of physiological data in the control group. The 20-min procedure involved watching another emotion-provoking film clip; however, participants responded naturally and received no instructions about how to manage their emotions. After completion of that procedure, participants began the current study.

Participants were told that they would be viewing another film clip shortly and were given one of two possible sets of instructions. Participants randomly assigned to the “suppression” group listened to a 5-min audiotape encouraging them to control their emotional reactions as much as possible during the film (e.g., “it is possible to experience emotions at lower levels if you really concentrate on controlling them;” “you should not have to put up with more discomfort and distress than is necessary”). Participants randomly assigned to the “acceptance” condition listened to a 5-min audiotape encouraging them to experience their emotions as fully as possible and to refrain from control efforts (e.g., “Struggling against relatively natural emotions can actually intensify and prolong your distress;” “Allow yourself to accept your emotions without trying to get rid of them”).<sup>1</sup>

Participants completed a questionnaire testing their understanding of the instructions and were told that they would view an emotion-provoking film in a few minutes. They sat quietly for a 2-min anticipation period and then completed the PANAS. Participants next watched the film clip and completed questions regarding their reactions to the film (PANAS, suppression rating). Afterwards, they were told to sit quietly for a few minutes, which constituted the 2-min recovery period. At the end of the recovery period, participants again completed the PANAS and rated their success in applying the experimental instructions.

## **Results**

### *General issues*

#### *Pre-experiment group differences*

The groups that resulted from the random assignment procedure were compared on demographic characteristics, clinical characteristics, and pre-film affective status. No between-groups differences were apparent in gender,  $\chi^2(1, N = 60) = 0.00, p = 1.00$ , age,  $t(58) = -0.90, p = .37$ , or ethnic minority status,

<sup>1</sup>Full scripts for the suppression and acceptance conditions are available from the first author.

$\chi^2(1, N = 60) = 1.46, p = .23$ . The groups did not differ in the average severity of principal diagnoses,  $t(58) = -1.42, p = .16$ , the average number of diagnoses per participant,  $t(58) = 0.00, p = 1.00$ , or the rates of participants who received one, two, three, or four or more diagnoses,  $\chi^2(3, N = 60) = 1.77, p = .62$ . The groups also did not differ on negative affect scores taken prior to the film,  $t(58) = 0.53, p = .60$ .

#### *Manipulation checks*

The manipulation checks suggested that participants understood the instructions and were able to distinguish between approaches of suppression and acceptance (range = 75–100% correct on the post-instructions quiz). Participants rated themselves as equally successful in applying the suppression and acceptance instructions,  $t(58) = 1.26, p = .21$ . Post-exposure questionnaires also suggested that participants followed the instructions they received. Whereas the suppression group endorsed moderate or higher suppression on average ( $M = 4.50$ ), the acceptance group reported very low levels of suppression ( $M = 1.50$ ). The between-groups difference on suppression was significant,  $t(58) = 5.77, p = .00$ .

#### *Prior exposure to the film clip*

Interviews after the experimental session revealed that 14 participants had prior exposure to the film. The acceptance and suppression groups did not differ in the proportions of individuals with prior exposure to the film,  $\chi^2(1, N = 60) = 0.37, p = .54$ . Furthermore, individuals who had prior exposure to the film did not differ significantly from naïve participants on levels of negative affect or physiological responses to the film ( $ps > .20$ ). Therefore, prior exposure to the film was not considered in further data analyses.

#### *Effect of suppression and acceptance instructions on negative affect*

A 3 (time)  $\times$  2 (condition) mixed model ANOVA was conducted in order to examine the impact of the suppression and acceptance instructions on negative affect. The repeated measure was PANAS-N scores for the anticipation, exposure, and recovery periods, and the between-subjects factor was instruction condition. Mean PANAS-N scores for each condition are presented in Table 1. One participant in the acceptance group had a PANAS-N score for the recovery period that was a significant outlier (4.5 standard deviations above the group mean). This score was recoded using a Winsorization procedure (i.e., recoding the score to equal the next-highest value; this allows the case to be retained but reduces the influence of the extreme value; Barnett & Lewis, 1994).<sup>2</sup>

The ANOVA showed a significant multivariate main effect of time,  $F(2, 57) = 21.22, p = .00, \eta^2 = .43$ . Within-subjects contrasts showed that the main effect of time was primarily quadratic in nature,  $F(1, 58) = 36.03, p = .00, \eta^2 = .38$ ; however, the linear contrast also was significant,  $F(1, 58) = 5.84, p = .02, \eta^2 = .09$ . Participants' negative affect increased from the anticipation to the exposure period, and then decreased from the exposure to the recovery period, indicating that the second film was successful in inducing short-term negative affect.

The multivariate time  $\times$  condition interaction effect also was statistically significant,  $F(2, 57) = 3.63, p = .03, \eta^2 = .11$ . Follow up 2 (time)  $\times$  2 (condition) ANOVAs demonstrated that condition impacted the change in PANAS-N from exposure to recovery,  $F(1, 58) = 6.11, p = .02, \eta^2 = .10$ . The time  $\times$  condition interaction was non-significant for the change from anticipation to exposure,  $F(1, 58) = 1.67, p = .20, \eta^2 = .03$  and for the change from anticipation to recovery,  $F(1, 58) = 3.21, p = .08, \eta^2 = .08$ . Fig. 1 depicts PANAS-N scores for the two conditions and shows that the acceptance group manifested a greater decrease in negative affect from the exposure to the recovery period than the suppression group.

#### *Impact of suppression and acceptance instructions on physiological responses*

Separate 3 (time)  $\times$  2 (condition) mixed model ANOVAs were performed to evaluate the relationship between instruction condition and HR, RSA, and SCL. The repeated measures were average HR, RSA, and SCL from the anticipation, exposure, and recovery periods, and the between-subjects factor was instruction

<sup>2</sup>It is important to note that when the outlying value is retained, the significant time  $\times$  condition interaction effect is reduced to a statistical trend (though of approximately the same effect size),  $F(2, 57) = 3.00, p = .06, \eta^2 = .10$ .

Table 1  
Means and standard deviations for self-report and physiological measures for acceptance and suppression groups

Measure	Acceptance	Suppression
<i>PANAS-N*</i>		
Anticipation	4.83 (5.02)	5.63 (6.59)
Exposure	9.43 (7.82)	8.30 (8.38)
Recovery	2.87 (3.49)	5.33 (7.45)
<i>HR**</i>		
Anticipation	68.95 (9.69)	68.10 (10.12)
Exposure	67.93 (9.91)	69.76 (11.37)
Recovery	69.78 (9.82)	69.00 (10.45)
<i>RSA</i>		
Anticipation	.079 (.048)	.100 (.049)
Exposure	.066 (.030)	.079 (.040)
Recovery	.085 (.049)	.111 (.052)
<i>SCL</i>		
Anticipation	11.21 (5.06)	11.08 (3.50)
Exposure	11.60 (4.79)	11.72 (3.60)
Recovery	11.60 (4.83)	11.84 (3.96)
Suppression (0–8)**	1.50 (1.59)	4.50 (2.36)

Note:

\* $p < .05$ .

\*\* $p < .01$ .

PANAS-N = Positive and Negative Affect Scales—negative affect; HR = heart rate in beats per minute; RSA = respiratory sinus arrhythmia in seconds; SCL = skin conductance level in microseimens.

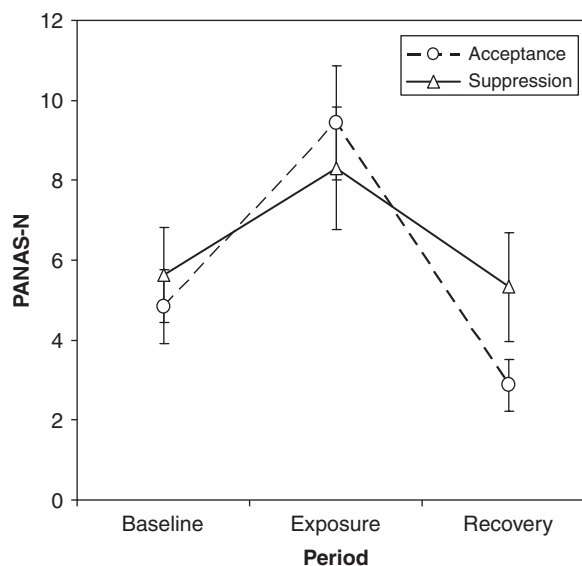


Fig. 1. Self-reported negative affect for acceptance and suppression groups during the anticipation, exposure, and recovery periods of the emotion induction.

condition. Means and standard deviations for HR, RSA, and SCL are presented in Table 1. Three participants were missing HR, five participants were missing RSA, and two participants were missing SCL due to technical difficulties.



The 3 (time)  $\times$  2 (condition) mixed model ANOVA for HR showed that there was a significant multivariate main effect of time on HR,  $F(2, 54) = 3.67, p = .04, \eta^2 = .11$ . Within-subjects contrasts showed that the main effect of time was linear in nature,  $F(1, 55) = 6.57, p = .01, \eta^2 = .11$ , and inspection of means showed that HR increased from the anticipation to the recovery period when collapsing across conditions. However, there also was a significant multivariate time  $\times$  condition interaction effect,  $F(2, 54) = 5.51, p = .01, \eta^2 = .17$ . Inspection of within-subjects contrasts showed that condition impacted the quadratic function,  $F(1, 55) = 9.97, p = .00, \eta^2 = .15$ . Although both suppression and acceptance groups increased in HR from anticipation to recovery, their trajectories were different. Participants in the suppression group showed an increase in HR from anticipation to exposure, and a decrease in HR from exposure to recovery. In contrast, participants in the acceptance group displayed a decrease in HR from anticipation to exposure, and an increase in HR from exposure to recovery (see Fig. 2). No between-subjects effect of condition on HR was apparent,  $F(1, 55) = 0.00, p = .98, \eta^2 = .00$ .

The 3 (time)  $\times$  2 (condition) mixed model ANOVA for SCL showed a significant multivariate main effect of time,  $F(2, 55) = 9.51, p = .00, \eta^2 = .26$ . The effect of time was linear in nature,  $F(1, 56) = 15.50, p = .00, \eta^2 = .22$ , and SCL generally increased from the anticipation to exposure period, and remained at approximately the same level through the recovery period. Contrary to prediction, the time  $\times$  condition interaction effect,  $F(2, 55) = 0.79, p = .46, \eta^2 = .03$ , and between-subjects effect of condition,  $F(1, 56) = 0.00, p = .95, \eta^2 = .00$ , were not significant.

Finally, the 3 (time)  $\times$  2 (condition) ANOVA for RSA showed a significant multivariate main effect of time,  $F(2, 52) = 11.14, p = .00, \eta^2 = .30$ . Within-subjects contrasts showed that the effect of time was quadratic in nature,  $F(1, 53) = 19.91, p = .00, \eta^2 = .27$ , and inspection of means indicated that RSA decreased from anticipation to exposure, and then increased from exposure to recovery. The time  $\times$  condition interaction effect,  $F(2, 52) = 0.31, p = .74, \eta^2 = .01$ , and between-subjects effect of condition,  $F(1, 53) = 2.09, p = .15, \eta^2 = .04$ , were not significant.

In summary, the film was successful in inducing the predicted changes in negative affect, HR, RSA, and SCL. Instruction condition had a significant effect on negative affect, with individuals engaging in suppression showing less recovery from changes in negative affect after the film ended than individuals engaging in acceptance. In addition, although the two groups had similar increases in HR from the anticipation period to the recovery period, they showed a different pattern of HR response *during* the film. Participants engaging in suppression manifested increased HR during the film (followed by a decrease during the recovery period), whereas participants using acceptance displayed decreased HR during the film (followed by an increase during the recovery period). The predicted between-groups differences in SCL and RSA were not observed.

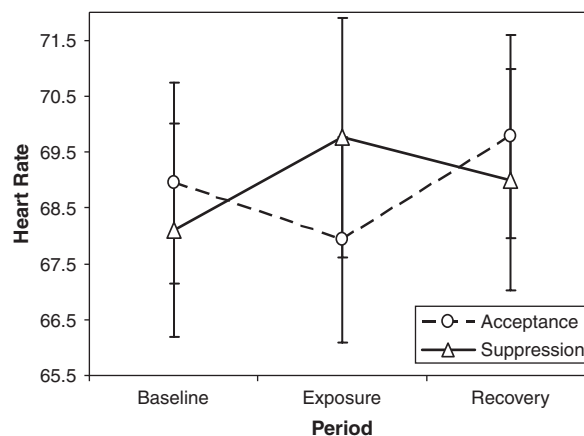


Fig. 2. Heart rates for acceptance and suppression groups during the anticipation, exposure, and recovery periods of the emotion induction. Note that the standard error bars overlap because heart rate estimates for the two groups did not differ significantly for any of the time periods. However, the pattern of change in heart rate across the periods differed significantly for the two groups (see Results).

## Discussion

The current study examined the effects of emotional suppression and acceptance in a sample of individuals with anxiety and mood disorders who were exposed to an emotion-provoking film. The study adds to the small body of existing literature (e.g., Levitt et al., 2004) that applies experimental paradigms involving directed emotion regulation to clinical samples. Research on the effects of different regulation strategies is particularly relevant to individuals with anxiety and mood disorders, who struggle on a regular basis with excessive and persistent negative emotions. Findings regarding the relative efficacy of emotion regulation strategies such as suppression and acceptance could be incorporated into psychosocial interventions targeting these problems. Moreover, experimental studies can provide validation for the recommendations about emotion regulation that are inherent in several existing behavioral treatments (e.g., Acceptance and Commitment Therapy; Hayes, Strosahl et al., 1999).

Based on prior research with non-clinical samples (e.g., Gross, 1998; Gross & Levenson, 1997), we predicted that emotional suppression would be an ineffective regulation strategy in the current emotion induction. We did not expect suppression to relieve subjective distress, even though that is its intended goal. Furthermore, we expected suppression to be associated with some counterproductive effects: namely, poorer recovery from changes in negative affect, increased sympathetic arousal, and decreased parasympathetic responding.

Consistent with our hypothesis, suppression did not decrease subjective distress relative to a comparison condition. Participants in the suppression group were encouraged to do their best to minimize their emotions, while individuals in the acceptance group were instructed to experience their emotions as fully as possible. Even with the possibility of demand characteristics leading to an underreport of negative affect in the suppression group and an over-report of negative affect in the acceptance group, the two groups reported similar increases in negative affect in response to the film. This provides quite convincing evidence that suppression is ineffective at diminishing the subjective experience of negative emotion.

The current study also builds on the existing literature by examining the persistence of negative affect *after* emotion induction. Thought suppression has been shown to produce a rebound of unwanted thoughts during post-suppression periods (e.g., Wegner et al., 1987), and pain suppression has been shown to interfere with recovery of pain after the stimulus has been removed (Cioffi & Holloway, 1993). We hypothesized that emotional suppression might lead to an analogous persistence of negative affect after the induction had ended. Consistent with this hypothesis, the suppression group manifested poorer recovery from changes in negative affect compared to the acceptance group. At the end of a 2-min recovery period, the negative affect reported by individuals who suppressed their emotions had subsided to a lesser extent than that observed in individuals who had accepted their emotions.

The suppression and acceptance conditions also were associated with different patterns of HR response, although the meaning of this difference is challenging to interpret given the multiple determinants of HR. The increased HR displayed by the suppression group in response to the film may have reflected the sympathetic arousal that has been found to be associated with suppression in previous studies (e.g., Gross, 1998). However, similar increases were not observed in the suppression group with a purer index of sympathetic arousal (SCL). An alternate explanation of the HR finding is that the decreased HR experienced by the acceptance group may be indicative of a stronger orienting response to the stimulus (Larsen et al., 1986). The acceptance instructions may have encouraged participants to become more focused and engaged in the film (e.g., in an effort to better connect with their emotions), thus leading to decreased HR. HR also tends to decrease with greater cognitive load, and it is possible that the acceptance instructions were more cognitively challenging (e.g., requiring more continuous monitoring of experience) than the suppression instructions. However, it can be noted that participants in the two groups did not differ in their perceived ability to implement the instructions.

Finally, suppression and acceptance did not appear to exert differential effects on the selected indices of sympathetic activation (SCL) or parasympathetic function (RSA). Suppression has been shown to increase SCL relative to comparison conditions in some prior studies (Gross, 1998; Gross & Levenson, 1997). With 30 participants per group and substantial inter-individual variation (e.g., our sample was more demographically diverse than studies using undergraduate volunteers), there may have been insufficient power to detect between-group SCL differences. Another possibility is that *expressive* suppression is associated with increased

sympathetic activation, while suppression of internal experience is not.<sup>3</sup> In studies conducted by Gross and colleagues, participants were asked to try to inhibit the expression of emotion, whereas in our study participants were asked to suppress the emotional experience itself. Other studies that have instructed participants to suppress internal emotional experience also have failed to find increased sympathetic activation in suppressors (e.g., Eifert & Heffner, 2003; Levitt et al., 2004). It may be that increased sympathetic arousal is more common when participants are focused on suppressing the behavioral expression of emotion.

The prediction regarding RSA was fairly speculative and thus the negative finding is not as surprising. Despite this null result, the impact of different emotion regulation strategies on parasympathetic responses warrants further investigation. Parasympathetic responses are integral to restoring homeostasis after arousal, and it will be important to determine whether certain strategies for emotion regulation facilitate or interrupt the functioning of this system.

The current study demonstrates the failure of emotion suppression to alleviate subjective distress in persons with anxiety and mood disorders, a group for whom suppression of emotions may be a “default” strategy. In another study comparing the current clinical sample to individuals with no history of emotional disorder, we found that these clinical participants spontaneously used suppression to a greater degree than control participants (Campbell-Sills, Barlow, Brown, & Hofmann, 2005). A separate investigation also found that individuals with panic disorder rated suppression instructions as being very similar to their usual coping methods (Levitt et al., 2004). The combined evidence that suppression is both prevalent and ineffective in this population lends support to treatment approaches that discourage attempts to suppress or diminish awareness of uncomfortable experiences, such as acceptance- and mindfulness-based interventions (e.g., Hayes, Strosahl et al., 1999; Segal et al., 2002). Much as patients with obsessive-compulsive disorder are cautioned about the counterproductive effects of thought suppression (e.g., Rachman, 2003), psychoeducational components of treatment for other anxiety and mood disorders may ultimately incorporate information about the negative effects of emotional suppression.

Several limitations of the present study are worth noting. Although the presentation of an acceptance rationale led to better mood recovery than the suppression rationale, this study is limited in the conclusions it can draw about the benefits of acceptance. Acceptance was primarily used as a comparison condition for emotional suppression and was not itself compared to any control condition. The acceptance rationale was chosen as a comparison condition because if participants followed the instructions it would be difficult (if not impossible) for them to engage in suppression. In contrast, individuals provided with no instructions might engage in suppression. As noted above, the likelihood of spontaneous emotional suppression may be particularly high in individuals with anxiety and mood disorders (e.g., Campbell-Sills et al., 2005; Levitt et al., 2004). However, the inclusion of a third group that received no instructions or a “placebo” rationale would have improved the study by allowing for any benefits of acceptance to be clearly documented.

Secondly, the current study would have provided a more comprehensive assessment of the effects of suppression and acceptance on emotional responding if it had included a behavioral measure. Other studies that compare these two approaches have found behavioral differences between individuals instructed to suppress and accept emotions, with acceptance leading to greater willingness to undergo future emotion provocations (Eifert & Heffner, 2003; Levitt et al., 2004). Indeed, reduced behavioral avoidance is a main focus of acceptance-oriented therapies (Hayes, Strosahl et al., 1999). To measure the behavioral outcomes of affective arousal, we could have asked participants if they would be willing to view another film and recorded their responses. In addition, future studies could use more noxious stimuli that would be more likely to provoke an avoidance response (e.g., stopping the film early) in a substantial percentage of participants.

With regard to physiological measurement, it is possible that a different approach to data reduction and analysis would have elucidated subtler between-groups differences. Our analysis program calculated average HR, SCL, and RSA for predetermined experimental epochs. A more fine-grained analysis of the temporal course of each measure within each period might have shown differences between groups. Moreover, use of other physiological indices such as rise time could have provided additional information about characteristic patterns of physiological responding associated with suppression and acceptance.

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<sup>3</sup>The authors thank an anonymous reviewer for offering this interpretation.

Like other studies that examine the effects of directed emotion regulation, the current investigation relies on participants to listen to the instructions, comprehend them, and apply them to the best of their abilities. We cannot guarantee that all participants followed the instructions, or did a good job suppressing or accepting. However, we included manipulation checks that diminish this concern to an extent. Our post-instructions quiz showed that participants were able to distinguish between acceptance and suppression and understood what they were supposed to do. The suppression group also endorsed higher levels of suppression than the acceptance group on a self-report rating after the film. An additional objective measure of compliance that could prove useful for future studies would be coding of facial expressions, which have been shown to be less intense when individuals are suppressing emotions (e.g., Gross & Levenson, 1997).

Finally, the sample recruited for this study was predominantly Caucasian, and results may not generalize to members of other ethnic groups. Non-Caucasian individuals endorse habitual use of suppression to a greater degree than Caucasians (Gross & John, 2003), and this may indicate that suppression serves a different function or has a different meaning in these groups. It will be important for future studies to examine the potential interaction between culture and the palatability and impact of different forms of emotion regulation.

The current investigation constitutes one of the first studies of emotion regulation in individuals with anxiety and mood disorders. Much work remains to be done in this area. Studies conducted with non-clinical samples have investigated other forms of regulation such as cognitive reappraisal (Gross, 1998), used the phenomenon of startle potentiation to examine pre-conscious emotion regulation (Jackson et al., 2003), and even begun to examine the neural bases of emotion regulation (Ochsner et al., 2004). Our understanding of the persistence of negative emotions that characterizes anxiety and mood disorders may benefit greatly from extending these lines of research to clinical samples. The pursuit of this knowledge will hopefully aid in developing and strengthening the next wave of behavioral therapies for anxiety and mood disorders.

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