

University of Nevada, Reno

**Effects of Anger Expressive Suppression on
Cardiac Response**

A thesis submitted in partial fulfillment
of the requirements for the degree of

Bachelor of Science in Biology and the Honors Program

by

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Abstract

Previous research lacked clarity on how expressive suppression of anger affects human well-being. Maladaptive regulation of emotion has been linked to mental, behavioral, and physiological health (Hopp, Troy, & Mauss, 2011; Cisler, Olatunji, Feldner, & Forsyth, 2010; Mauss & Gross 2004). **The main purpose of this study is to determine how cardiac response, specifically cardiac interbeat intervals (IBI), alter when suppressing expression of anger.** Twenty undergraduate students were recruited from the University of Nevada, Reno and were randomly assigned to one of two experimental groups: those instructed to suppress any facial expressions that indicate emotional arousal and those instructed to pay attention in response to an anger-induction. The stimulation of anger involved negatively criticizing participants on a writing task they were instructed to complete, using harsh and derogatory language. The results from the study revealed that expressive suppression of anger decreases cardiac responding. Additionally, following anger-induction, there were no differences in cardiac interbeat intervals or subjective levels of frustration and tension between groups. Implications for the understanding of the effects of anger suppression are fundamental for overall human health.

TABLE OF CONTENTS

ABSTRACT.....	i
TABLE OF CONTENTS.....	ii
LIST OF FIGURES	iv
LIST OF FIGURES/TABLES	v
Chapter	
1. INTRODUCTION/LITERATURE REVIEW	1
2. METHODOLOGICAL APPROACH.....	12
Study overview	12
IRB approval.....	14
Experimental procedure	14
Time 1: Neutral induction and measurements	17
Time 2: Anger induction and measurements	19
3. MEASURES AND DATA PLAN	23
Acquisition of cardiac response	23
State Emotion Ratings (SER).....	25
Data analysis	25
4. RESULTS	25
Randomization check.....	25
Hypothesis testing.....	27
5. DISCUSSION.....	29
6. REFERENCES	35
7. APPENDIX A: IRB application approval letter.....	42

8. APPENDIX B: Flyer template.....	43
9. APPENDIX C: IRB-approved consent form	44
10. APPENDIX D: Debriefing Statement.....	48
11. APPENDIX E: Subjective emotion rating (SER) questionnaire	49
12. APPENDIX F: Emotion process (EPro) questions	50

LIST OF FIGURES

Figure 1. Emotion-processing pathway.....	5
Figure 2. R-R intervals between successive QRS peak.....	11
Figure 3. The study’s experimental room.....	13
Figure 4. Experiment procedure pathway.....	14
Figure 5. Biopac electrode placement on participants.....	16
Figure 6. Writing prompt during T1.....	18
Figure 7. Simulated evaluation during T1.....	18
Figure 8. Participant ECG recording.....	19
Figure 9. Example of SER question.....	19
Figure 10. Writing prompt during T2.....	20
Figure 11. ECG to IBI on Acqknowledge.....	24
Figure 12. Time factor is significant for emotion-suppressed group’s IBI.....	27
Figure 13. Pre- and post-exposure events in emotion regulation.....	30

LIST OF TABLES

Table 1. Mean IBI of independent groups at T1.	26
Table 2. Mean ratings of self-report frustration and tension before anger- induction	27
Table 3. Comparing mean cardiac IBIs within-subjects and between-subjects ..	28
Table 4. Post-hoc analysis to evaluate pair-wise comparisons	28
Table 5. Mean self-report frustration and tension rating following anger- induction	29
Table 6. Between groups comparison for self-report frustration and tension post anger inducing manipulation	29

Effects of Anger Expressive Suppression on Cardiac Response

A 2015 survey by the Substance Abuse and Mental Health Services Administration (SAMHSA) estimated that 43.4 million, (17.9%) United State adults are considered with Any Mental Illness (AMI). This classification of mental disorders includes illnesses that are considered non-serious, such as acute stress disorder, attention deficit hyperactivity disorder, and generalized anxiety disorder. It also includes serious illnesses, like schizophrenia, bipolar disorder, major depression, and posttraumatic stress disorder (Bose, Hedden, Lipari, & Park-Lee, 2016; “Serious vs. non-serious, 2008), which may constitute severely negative outcomes such as physical disabilities, unemployment, violence, and even suicide (Bassett, Chase, Folstein, & Regier, 1998).

Clinicians refer to a detailed manual (i.e. *Diagnostic and Statistical Manual of Mental Disorders*) to diagnose and classify mental disorders. The handbook outlines symptoms for each mental illness, along with the relationship between various illnesses. There are twenty categories of mental disorders, including personality disorders, depressive disorders, anxiety disorders, and bipolar and related disorders (American Psychiatric Association, 2013). Anxiety disorders are considered the most common subclass of mental disorders, with an estimated lifetime prevalence of 28.8% (Kessler, Berglund, Demler, Jin, Merikangas, & Walters, 2005) and an estimated annual cost of \$42.3 billion in the United States (Greenberg et al., 1999). Although having not increased in prevalence within the past two decades, anxiety as well as major depressive disorder (MDD) affects millions of individuals globally (Baxter, Scott, Ferreri, Norman, Vos, & Whiteford, 2014). Furthermore, anxiety and MDD

have been linked to other maladies, such as cardiovascular disease (Davis, Dragovic, Davis, & Starkstein, 2016).

Anxiety, mood, and other psychopathological disorders are thought to be associated to maladaptive emotion regulation (Campbell-Sills, Barlow, Brown, & Hofmann, 2006). A study by Tull & colleagues (2009, 2008) asserted that emotion regulation difficulties serve as a red flag for possible general anxiety disorder (GAD) in patients, for example (Tull, Stipelman, Salters-Pedneault, & Gratz, 2009; 2008). The current study did not intend to investigate any specific mental disorder but the effects of emotion regulation on physiological responding.

Emerging studies on emotion regulation

To understand emotion regulation, though, it is first imperative to understand and be able to differentiate emotion regulation from emotion. Emotions are multidimensional and involve experiential, behavioral, and physiological components. Subjective experience are difficult to measure because it cannot be observed like emotion-related behavior (e.g. crying, laughing, eye-rolling) or emotion-related physiological responses (e.g. blushing, sweating). Campos and colleagues (1989) presented the unrenowned notion that emotions are not mere “feeling states indexed by behavioral expressions,” but emotions are rather “processes of establishing, maintaining, or disrupting the relations between the person and the internal or external environment, when such relations are significant to the individual” (Campos, Campos, & Barrett, 1989, p. 395). This new conceptualization concerning emotion – from being simple subjective feelings to being a complex interconnected network involving environment relevance, nature of stimulation, and

presentation of communication – led to a growing interest in emotion development and regulation research; PsychINFO citations consisting of keywords *emotion regulation* dramatically increased from four listings in 1990 to 671 in 2005 (Gross, 2007).

Emotion regulation refers to “the process by which individuals influence *which* emotions they have, *when* they have them, and *how* they experience or express these emotions” (Gross, 2007, p. 275). Emotion regulation strategies divide into two chief categories – mostly adaptive (e.g., acceptance, problem solving, appraisal) and mostly maladaptive when employed chronically (e.g. avoidance, rumination, suppression: Aldao, 2013; Aldao, Nolen-Hoeksema & Schweizer, 2010). Emotional acceptance and reappraisal, though seeming identical, have very different meanings. Acceptance, as the term implies, is the act of wholly accepting an emotion as it is received, regardless if the emotion felt is positive or negative (Campbell-Sills et al., 2006). Reappraisal, on the other hand, is the act of reinterpreting one’s outlook towards an emotional situation to make the situation less emotional (McRae, Ciesielski, & Gross 2012). Contrary to the acceptance strategy, suppression is the deliberate act of inhibiting one’s emotions (Campbell-Sills et al., 2006). Suppression can indeed be useful in every day social interchanges, such as remaining calm during a class presentation or disregarding a person who bumps into a friend at the store. However, chronic or habitual emotion suppression appears to have a negative effect on the health and well-being of an individual (e.g. Hopp et al., 2011; Gross & John, 2003; Gross & Levenson, 1997).

Antecedent vs. response focused regulation

Gross & John (2003) showed that expressive suppression was a maladaptive emotion regulation strategy. In comparison to cognitive reappraisal, expressive suppression caused more symptoms of depression and endorsed lower self-esteem and less optimism (Gross & John, 2003). The opposite was true of those who habitually used reappraisal; they reported less depressive symptoms and scored higher on each of the Ryff Psychological Well-Being (1995) scales. The Psychological Well-Being questionnaire included the following six psychological measures: “self acceptations, positive relations with other, autonomy, environmental management, meaning of life, and personal growth” (Henn, Hill, & Jorgensen, 2016).

Both expressive suppression and cognitive reappraisal strategies involved some form of modification, but each strategy exhibited its modification at different points of the emotion-processing pathway (Gross, 1998a). Cognitive reappraisal was considered an antecedent-focused strategy because its modifications preceded the emotional response, whereas expressive suppression was considered a response-focused strategy and followed the emotional behavioral response (Figure 1: Gross, 2001). The results revealed that modifications at different time points had differing consequences on human health (Gross & John, 2003).

The findings in Gross’ study (2001) attributed the dissimilar consequences between reappraisal and expressive suppression to the fact that cognitive modification did not require long-term regulation. In other words, the process of appraisal terminated even before the behavioral response took place. Expressive suppression, on the other hand, involved continuous behavioral modification following the

emotion response, causing an increase in effort and physiological response (Gross, 2001). It is worthy to mention that emotion information processing is exceptionally rapid (i.e. occurs within milliseconds: Dodonova & Dodonova, 2012).

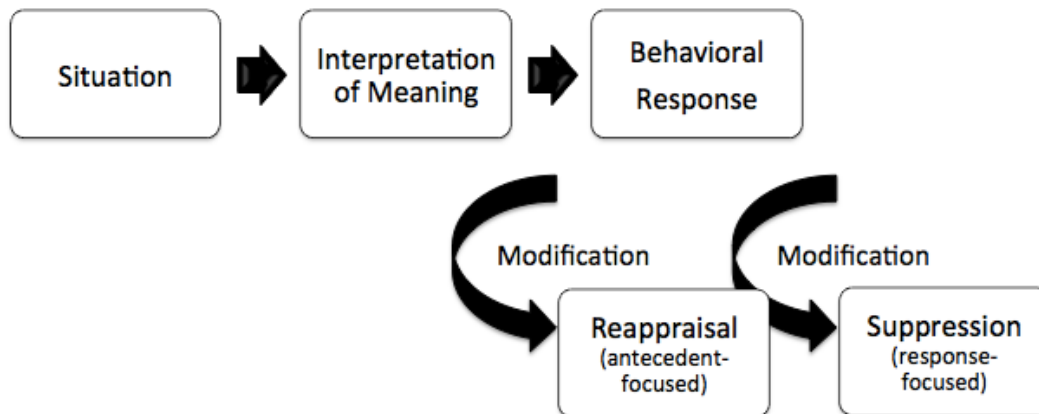


Figure 1. Emotion-processing pathway. Reappraisal involved a cognitive modification during the interpretation of a situation (i.e. emotion stimuli), however suppression strategy involved manipulation of a response, specifically behavioral.

Along with psychological differences between cognitive reappraisal and expressive suppression, the two strategies also have distinctive *physiological* effects. Results from Buck's research (1979) exhibited that unexpressive individuals were more physiologically reactive to a variety of emotional stimuli than expressive individuals (e.g. Field & Walden 1982; Buck 1979). To further investigate those results, Gross & Levenson (1997) directly examined the physiological effects of conscious inhibition of expressive emotion. Their study was significant because it was the first to identify the direct correlation between behavioral (i.e. expressive emotion expression) and physiological response; they hypothesized that emotional suppression would lead to heightened physiological reactivity.

Physiological effects vary depending on the emotion

The methodological approach of Gross and Levenson (1997) involved the presentation of sadness, amusement, and neutral film clips. Participants were randomized into either the suppression group or the control group. Measurements included video recordings, self-report emotions, and physiological measures (e.g. cardiac interbeat interval, skin conductance, finger pulse, respiratory period). Sadness and amusement suppression both resulted in enhanced sympathetic activation of the cardiovascular system. However, results revealed no differences between control and emotion-suppressed participants during the neutral film clip across all physiological variables. These findings suggested that physiology is impacted only when a strong impulse to suppress is present. Therefore, for this paper's study, it was unnecessary to include a methodological phase that compared emotion suppressed with non-emotion suppressed individuals during neutral stimulation for reasons other than having a baseline measurement.

Although Gross and Levenson's (1997) results supported their prediction that expressive emotion suppression increased physiological activity, the data could not be applied to other forms of emotion regulation (e.g. experiential emotion suppression). Another weakness of their study was that participants were advised during the beginning of the experiment that the study coordinators were "interested in learning more about emotion," which could have potentially altered participants' responses (Gross & Levenson, 1997 p. 97). To prevent participant preconceptions, the current study carefully wrote a cover story with a deceptive study purpose (i.e. interested in how students respond to writing topics). Additionally, Gross and Levenson (1997)

only enrolled female undergraduate students to participate in the study, disallowing insight on emotional process differences between genders (e.g., Timmers, Fischer, & Manstead, 1998). The current study used results from Gross & Levenson's study (1997) along with others (e.g. Boland, Papa, Del Carlo, under review; Buck et al., 1979) to formulate a research question that focused on the relationship between suppression and heightened physiological activity.

Experiential vs. expressive emotion suppression

Published studies (e.g. Cutuli, 2014; Gross et al., 2003, Gross, 2001) have mainly focused on *expressive* emotion suppression. However, another form of emotion suppression, *experiential* emotion suppression, exists. While expressive emotion suppression is the conscious inhibition of one's own emotional external expressive behavior, suppressing experiencing involves suppressing any emotions felt internally during emotion arousal (Gross & John, 2003).

The primary attention of the current study is expressive emotion suppression (ES) because it is a more reliable form of measurement compared to experiential emotion suppression strategy (Boland et al., under review). Boland and colleagues (under review) compared the effects of expressive and experimental emotion suppression using physiology measures of skin conductance response (SCR) and cardiac interbeat interval (IBI). They discovered (1) attempts to alter emotional experience may have involved engagement with alternation of facial expression and (2) instructing participants to suppress internal feelings may have encouraged them think about those feelings more, resulting in an ineffective attempt of experiential suppression. Those conclusions were based on data revealing that experiential

emotion suppressed and control group showed no difference in either SCR reactivity or cardiac responding (Boland et al., under review). The challenge in controlling for experiential emotion suppression supported the current study's decision to focus on expressive emotion suppression.

Emotion suppression studies involving anger

There has been considerable research done on emotion regulation strategies across multiple emotions (e.g. Boland et al., under review; Shallcross, Ford, Floerke, & Mauss 2013). Boland and colleagues (under review) compared participants' cardiac and skin conductance response during periods of sadness and during periods of anxiety. Results showed that suppression of sadness had no effect on self-report sadness, but suppression of anxiety revealed lower levels of self-report anxiety. When comparing cardiac responding to a control, suppressing emotion to a sadness-induction resulted in decreased responding while suppressing emotion to an anxiety-induction increased cardiac responding (Boland, under review). The inconsistent results between emotions indicated that the effects of suppression differed depending on what emotion(s) an individual attempted to suppress, which also supported Gross and Levenson's (1997) findings. These response discrepancies in suppression from the mentioned findings (i.e. Boland et. al, under review; Gross & Levenson, 1997) indicated that effects of suppression could be different for other emotions as well, like for anger.

A deficiency on anger expressive suppression research is one reason for selecting anger as the emotion of focus. Another valid reason for putting attention on anger is because it is typically perceived as a negative emotion to express, and it

should be regulated in everyday social settings (Mauss, Evers, Wilhelm, & Gross, 2006). Mauss and colleagues (2006) conducted some of the first anger suppression studies; however, her study was confined to female students only. Their reasoning for the gender restriction was to minimize any variance caused by gender differences.

Bases for current study's methodology

In the past, emotion-inducing experiments included the elicitation of anger through film clips (Schaefer, Nils, Sanchez & Philippot, 2010). Studies (e.g. Rottenberg, Ray, & Gross 2007; Hagemann, Naumann, Maier, Becker, Lurken, & Bartussek, 1999) have shown film clips to be an appropriate method to elicit specific emotions in participants (Rottenberg, Ray, & Gross 2007). By looking at positive affects in response to watching various films, emotion-induction using film clips did not deem as effective in eliciting anger in comparison to eliciting sadness (Schaefer et al., 2010).

The current study elicited anger in participants through the delivery of harsh criticism in response to a writing task participants are asked to complete. This particular method was comparable to Mauss and colleagues' study (2006), which required participants to complete a tedious task while being constantly interrupted with rude scripted remarks from the experimenter (Mauss et al., 2006). Negative criticism has shown to induce anger and attitudinal reactions (Niemann, Wisse, Rus, Van Yperen, & Sassenberg 2014). Similar to negative anger-provoking film clips, negative anger-provoking criticism is common to daily life and its effects on individuals are important to understand. Additionally, giving instructions to participants on how to regulate their emotions in response to emotion-inductions (i.e.

“pay attention” and “pay attention, but do not show any expression on your face so that if someone else were watching you, they would not be able to tell that you were feeling anything”) have been widely successful for previous studies (Boland et al. under review; Campbell-Sills et al. 2006; Gross, 1998b). These instructional methods was applied to this current study’ experimental protocol.

Bases for current study’s measurements

Previous suppression research (e.g., Campbell-Sills et al., 2006; Mauss, Levenson, McCarter, Wilhelm, & Gross, 2005) found that measures of cardiac responding are efficient in observing autonomic activity and provide measures of both sympathetic and parasympathetic activity (Geisler, Vennewalk, Kubiak, & Weber, 2010). Cardiac response can be measured using an electrocardiogram (ECG) device. This device is able to detect QRS complexes, as well as P and T waves (Yeh, Wang, 2008). QRS peaks correspond to electrical activities, generated by depolarization of the right and left ventricles of the heart (Mehta & Lingayat, 2008). Depolarization describes the process of ionic movement and change; once enough movement has reached a specific threshold, a contraction can occurs. The regulation of contraction and relaxation of the heart muscle is what causes a heartbeat (Katz & Lorell, 2000). The peaks of successive QRS complexes represent the R peak. R-R interval, also known as cardiac interbeat interval (IBI) is the time between consecutive R peaks in the waveform (Figure 2). R peaks are always positive. The time distance between the peaks is inversely correlated with heart rate (i.e. the closer the R-R peaks, the faster the heart rate).



Figure 2. R-R intervals between successive QRS peak. R wave corresponds to the point of the QRS peak. Greater time (ms) between R-R intervals indicate slower the cardiac response.

The current study's hypotheses

The current study involved eliciting anger in participants through the delivery of negative criticism for a writing prompt that participants were instructed to respond to via a computerized stimulation. Self-report ratings (i.e. subjective emotion ratings) and cardiac response (i.e. cardiac interbeat intervals) were used as measures.

Subjective emotion rating (SER) questions queried participants' on the level of intensity they felt a specific emotion presented in a scale-like manner. The primary research question is whether or not suppressing anger affects cardiac patterns and if so, how? **The first hypothesis (H1) for this study is that greater cardiac response will be observed in the suppressed group in comparison to the control group, who will have lower responding because the suppressed group will have increased sympathetic nervous system activation of the cardiovascular system.**

The second hypothesis (H2) is that the suppressed group, in comparison to the control group, will score higher on subjective ratings of frustration and tension.

This paper contributes towards a better understanding of the implications of suppression for the diagnosis and treatment of psychopathology, the study of mental disorders, and physiological illnesses. Additionally, the paper hopes to educate those interested in emotion and self-regulation of emotion, such as social scientists and medical researchers, because findings confirmed by experimental research have shown that suppressing emotion leads to negative health outcomes and improving emotion regulation skills has a favorable effect on perceived health (van Middendorp, Feenen, Sorbi, Doornen, & Bijlsma 2005).

METHODOLOGICAL APPROACH

The study aimed to examine anger expressive suppression effects on cardiac response. The study utilized a between-group design approach (i.e., two groups of subjects, who were randomly assigned, being tested by different variables) to compare measures of self-report emotion ratings (SER) after a manipulation task. In addition, autonomic physiological responses, explicitly cardiac interbeat intervals (IBI), were measured and compared between groups and during two time intervals. The need for a control group was important to ensure that the results obtained were a direct effect of anger suppression.

Superlab 4.5 experiment software was used to customize a computerized simulation. The set-up process involved manual input of textual stimuli that allowed participants to directly respond to particular instructions via keystrokes. Subjection

emotion rating (SER) responses were recorded on Superlab. Participant cardiac interbeat interval was recorded using Biopac MP150 (400Hz) Acquisition Hardware and ECG100C Electrocardiogram Amplifier. The files were analyzed and R-R intervals were calculated on Acqknowledge 3.9 analysis software package (i.e. analyzing procedure outlined within the measures and data plan section).

The study utilized two rooms. There was an experiment room (Figure 3), where participants completed their tasks on Superlab. There was also a control room, equipped with two computers – one computer displaying participant’s physiological measurements on Acqknowledge and the other computer acting as a second monitor to the computer in the experiment room. The study coordinator, myself, remained in the control room throughout the study, with exception to the consent and debriefing process.



Figure 3. The study's experimental room. Participants were brought to a confidential room and completed their writing tasks on a computer. The room was equipped with an intercom system that allowed for direct communication to the study coordinator when necessary.

Institutional Review Board (IRB) approval

Application package (reference #: [981479-1]) was submitted to the University of Nevada, Reno Social Behavioral Institutional Review Board. The package included a cover letter, application, consent waiver form, and all documents used in the study (i.e. consent form, advertisement, SER questionnaires, and debrief script). The study received approval on January 4, 2017 via expedited review as minimal risk research involving incomplete disclosure/deception (Appendix A).

Experimental procedure

The experimental procedure is outlined below (Figure 4).

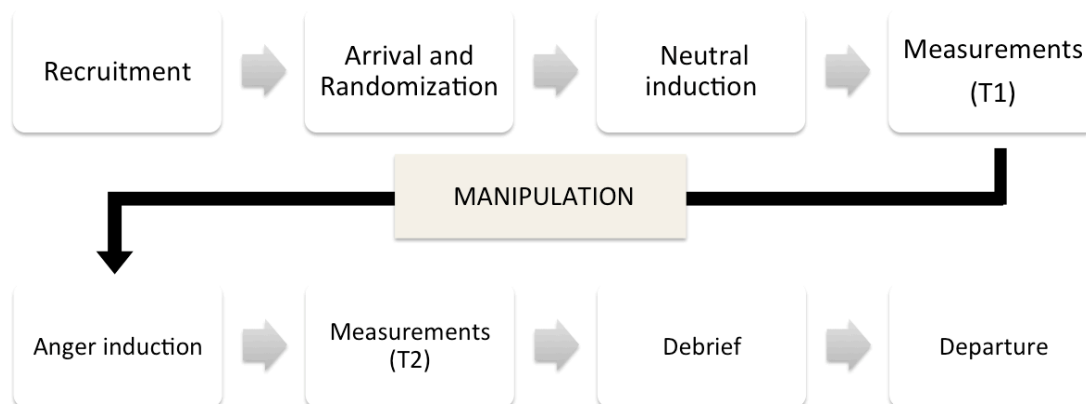


Figure 4. Experiment procedure pathway. The process consisted of: recruitment, arrival and group randomization, neutral induction with measurements, manipulation, anger induction with measurements, debrief, and participant departure.

Recruitment and participants

Data collection took approximately two months (February 15 – March 28, 2017). Twenty individuals (15 women (75%), 5 men (25%), $M_{\text{age}} = 20.6$ ($SD=2.36$, age range: 18-23 years) participated in the study. Participants identified as being European-American (35%), Hispanic (30%), African-American (5%), Asian American (20%), Native American (5%), and Mixed Ethnicity (5%). The sample size was less than the originally anticipated forty participants. During initial planning, it was projected that approximately 8-9 experiments would take place per week, based on a previous suppression studies conducted at UNR, which had an average weekly experiment rate of nine (Boland et al., under review). Although having twelve appointment slots available, only 2-3 sign-ups occurred each week.

Majority of participants ($N= 14$) were recruited through the University of Nevada, Reno's SONA Psychology Experiment Sign-Up System. Physical flyers were also posted throughout campus, enrolling the remaining participant pool (Appendix B). Two SONA credits, if applicable, were awarded via standard

procedures following participant's completion of the study. In order to be eligible, participants were required to be at least eighteen years of age and fluent in English. The age requirement was established because the study focused on the adult population, defined here as eighteen and older. It was critical that participants were able to read and write in English to successively complete required tasks in the study. Participants self-assessed and confirmed their eligibility by signing up for the study.

Arrival and randomization

Participants were instructed to arrive to the experimental site waiting room (i.e. UNR Mackay Social Science building room 327). The study coordinator, myself, directed each participant to a private room, setup with a Dual Speed Dohm Sound Conditioner for increased confidentiality. The study coordinator went over the IRB approved consent form (Appendix C), explaining the study's purpose and protocol with each participant. All participants received the same cover story (i.e. "the purpose of this study is to investigate how different types of students write about certain topics"); the true nature was disclosed during the debrief session at the end of the study.

Upon retrieving consent, three electrodes were placed on each participant. The study coordinator demonstrated the areas that electrodes would be placed – (1) underneath the left collarbone halfway between the neck and left shoulder, (2) underneath the right collarbone halfway between the neck and right shoulder, and (3) underneath the lowest left floating rib (Figure 5).

Participants were coached how to locate and clean those areas using Biopac EEG/ECG Skin Prep Gel. A dime-size amount of Signa electrode gel was applied to the center of each electrode before being placed on the participant's skin, and appropriate lead wires connected electrodes to the ECG system. The study experimenter was trained for the procedure, and the process involved no physical harm or pain to participants.

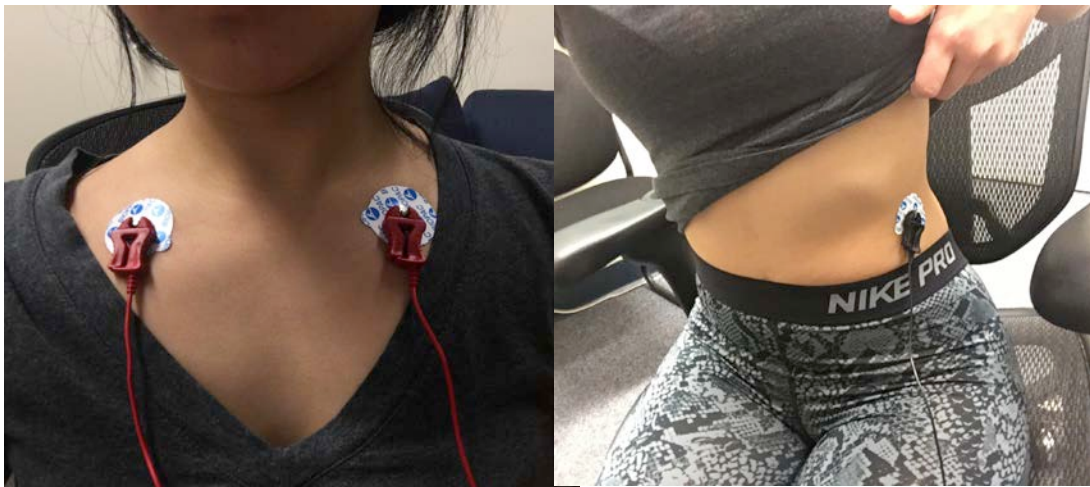


Figure 5. Biopac electrode placement on participants. Electrodes were placed on collar bones and under left rib of all participants then connected to Biopac ECG system via red and black wire leads.

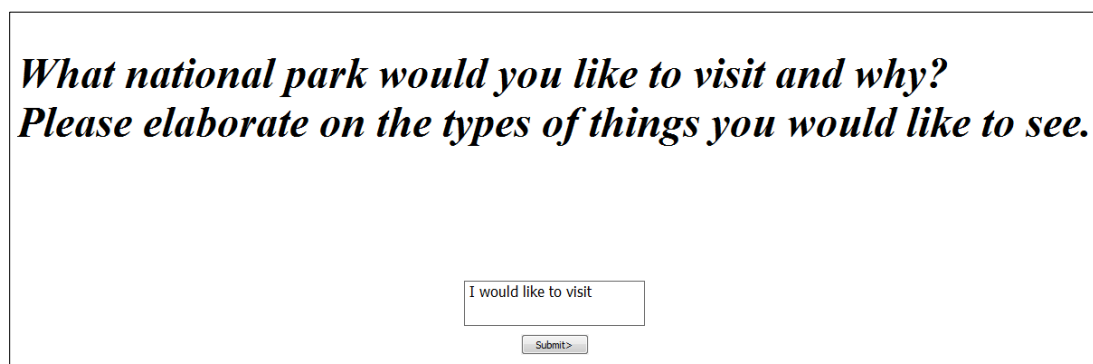
A five-minute calibration was required. During this period, participants remained in the experiment room and refrained from movement, while the study coordinator was in the control room observing cardiac activity to detect efficient electrode placement. During this calibration period, participants were randomly assigned into one of two groups through a dice roll (i.e. odd numbers designated anger-suppressed group and even numbers designated control group). Individuals were appointed participant numbers in chronological order of their timeslot.

Information tying participants to their participant number and group was retained on an Excel sheet on a passcode-locked computer in a key-locked room.

The study coordinator then returned to open the appropriate Superlab file, according to group assignment, and advised that the participant may begin. The study coordinator exited the experiment room and remained in the control room for the remainder of the study.

Time 1: Neutral induction and measurements

All 20 participants experienced the same instructions. The instructions for the first task stated: “You will have up to 5 minutes to respond to a writing prompt. You may press submit when you are finished. However, once the time is up, your response will automatically be submitted and the screen will change.” In order to prevent eliciting unintended emotions (e.g., anxiety, stress), the instructions also mentioned that participants are not expected to formulate an organized nor well-developed response free of grammatical errors. The prompt was as follows: “What national park would you like to visit and why? Please elaborate on the types of things you would like to see,” as seen in (Figure 6).



***What national park would you like to visit and why?
Please elaborate on the types of things you would like to see.***

I would like to visit

Submit>

Figure 6. Writing prompt during T1. All twenty participants were asked to respond to a neutral writing prompt. During T1, all stimuli were intended to be as neutral as possible to

avoid elicitation of any emotion during baseline.

Following the submission of their typed response on the computer, participants then received a neutral stimulus in the form of a unbiased feedback response in regards to their writing: “Thank you for your response, maybe some day you will be able to visit that national park.”

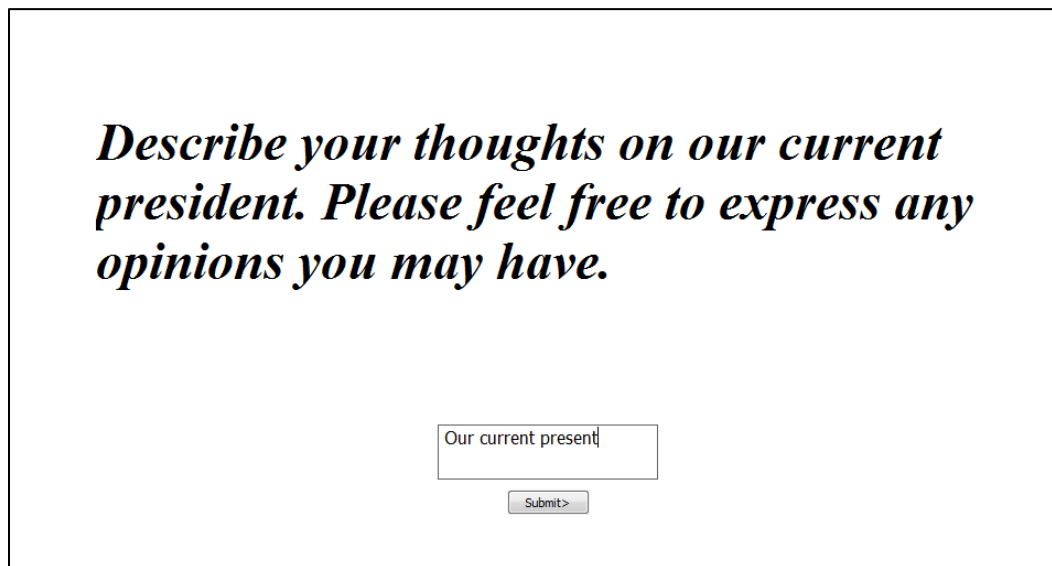
Your response is being saved to study records. It will take just a few minutes. In the mean time, please read the following feedback and please try to keep your shoulders as still as possible.

"Thank you for your response, maybe some day you will be able to visit that national park."

Figure 7. Simulated evaluation during T1. The displayed message was delivered to all participants regardless of assigned grouping. Cardiac IBI was measured simultaneously.

Participants were advised to remain still while their writing submission was being saved to study records. The screen remained unchanged and participants' baseline cardiac IBI was measured for two-minutes (Figure 8). In the control room, the study coordinator placed markers (i.e. pressing F9) on the ECG recording to indicate the start and end of the two-minute period.

participants: “Describe your thoughts on our current president. Please feel free to express any opinions you may have,” as shown in (Figure 10).



Describe your thoughts on our current president. Please feel free to express any opinions you may have.

Our current present

Submit>

Figure 10. Writing prompt during T2. Again, all participants were instructed to respond to the same prompt. This prompt was more debatable, unlike the unbiased first prompt. It was projected that participants were more invested when responding to controversial prompts.

The study was not concerned with the participant’s response, but rather, it was focused on participant’s cardiac IBI during their *manipulation* task described below. After completing the second prompt but before receiving their criticism, participants were provided distinct instructions according to their assigned group:

1. Control: “Many research findings show that individuals who pay attention to criticism are better able to recall content and make accurate judgments about what they are presented. Therefore, paying attention to criticism may show the benefits of paying attention to events in real life. For instance, paying attention may help you more easily accomplish tasks you perform. Research shows that it is possible for people to be more accurate about their reactions and their judgments when

they pay attention to what is going on in a situation. With that in mind, please pay attention to the criticism that will momentarily display on the screen.”

2. Suppression: “Many research findings show that individuals who suppress, or try not to outwardly express the emotions they experience, are better able to recall content and make accurate judgments about what they are presented. Actively hiding feelings from others can also help you to more easily accomplish tasks you perform. Additionally, hiding the feelings you are experiencing will enable you to not have to show any unnecessary emotional discomfort or distress in social situations. Research shows that it is possible for people to hide their emotions from others if they really concentrate on trying not to express them. Please pay attention to the criticism that will momentarily display on the screen. While paying attention to the criticism, do everything possible to not express any emotions on your face. Whatever you may feel while reading the criticism, try to not let those feelings show so that if someone else were watching you, they would not be able to tell that you were feeling anything.”

Scripted instructions were modified from Boland and colleague’s (under review) suppression study (e.g. Boland et al., under review).

Both control and suppressed groups received the same pre-written criticism, which was intended to deliberately elicit anger in participants. The criticism was as follows: “Thank you for your response, but that was by far one of the worst essays I have ever read. Please reevaluate your opinions, as they seem quite ignorant. Sounds like you have not thought about this much. Also, you could have double-checked your grammar before submitting it. That was very poor writing for a so-called

college student. You should consider enrolling in English 101 if you have not already.”

Again, cardiac IBI was measured for two-minutes while participants read their feedback and performed their instructed task (i.e. pay attention or suppression); indication markers were placed on ECG recording. Participants were again asked to respond to the SER questionnaire; questions were identical to T1 SER. Following completion of SER, participants responded to 11 emotion process questions (EPro) to assess the degree to which they followed their assigned instructions (1 = *not at all* to 9 = *extremely*). Completion of EPro questions concluded the study.

Debrief and departure

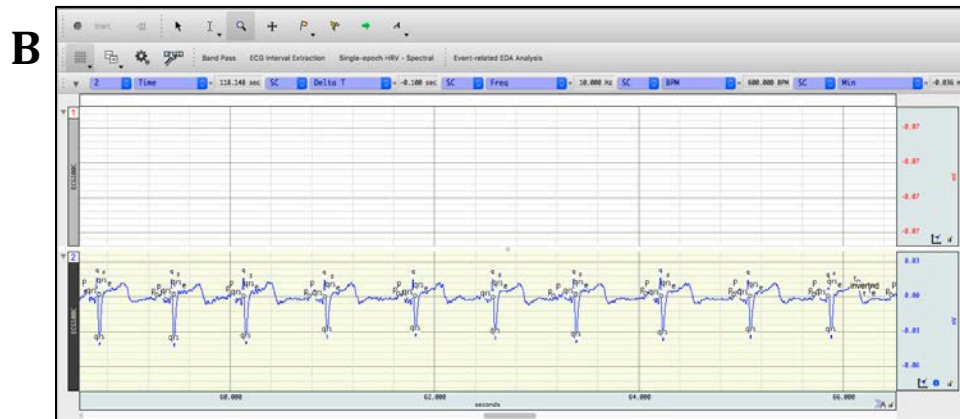
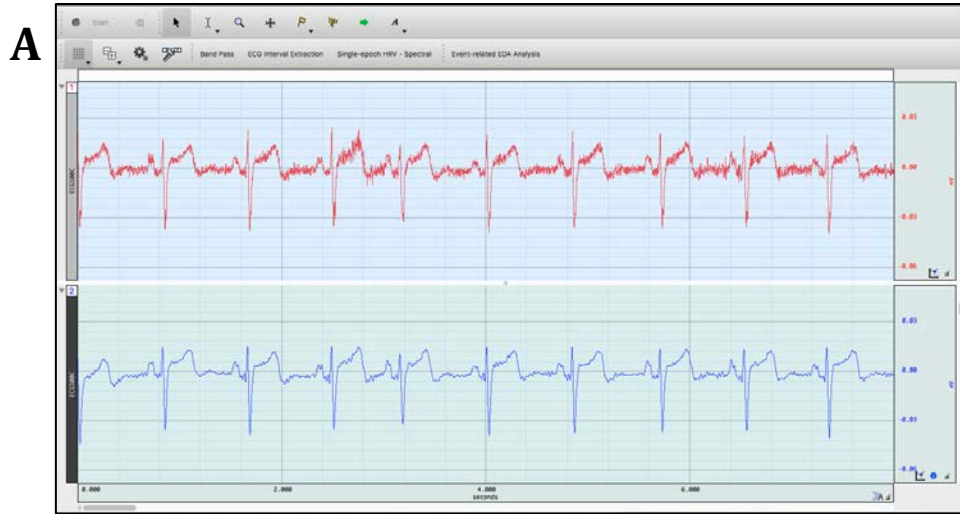
The study coordinator entered the experiment room to remove the electrodes and then debriefed participants. The debriefing process revealed that the authentic purpose of the goal was to examine suppression of anger expression and its effects on cardiac activity since positive efforts to regulate strong emotions have been association with beneficial physiological consequences. Participants were explained that a cover story was necessary in order to avert participants from self-monitoring their emotions because that can influence participant’s emotional experience and alter results. Additionally, participants received general information about mental health counseling, such as services offered at the University of Nevada, Reno, as well as, contact information to the local after-hours Crisis Line. Complete debrief script is found in Appendix D. Lastly, participants were asked three questions about their demographics (i.e. How old are you? What sexual orientation do you identify with?

What is your ethnicity?). The experiment duration lasted approximately 35-45 minutes. There was no additional portion of the study at a later time.

MEASURES AND DATA PLAN

Acquisition of cardiac response

Biopac MP150 (400Hz) and ECG100C Electrocardiogram Amplifier measured cardiac IBI. Acqknowledge 3.9 analysis software package filtered and analyzed IBI recordings. Using the previously indicated markers, physiological recordings were separated into two files that represented the two time points of interest (i.e. after baseline, after manipulation). Mean IBI calculations were made for those time points only; all physiological data pertaining to other time periods (e.g. participant responding to writing prompts, participant rating their emotional experiences) were disregarded. Each ECG file was filtered using high-pass filtering methods with a frequency fixed at .50 – 35.0 Hz and 16000 coefficient. Filtering at these magnitudes will smooth out the ECG waves and remove “noise” caused by movement (e.g. participant sneezing, coughing) (Figure 11a). The filtered files were transformed using ECG interval extraction methods that detected and labeled QRS complexes (Figure 11b). Any remaining incorrectly labeled R-R intervals were manually removed using a mouse. R waves were located using a QRS detector with a beats per minute (BPM) range fixed at 30 –240 and R wave threshold set at 50% max R peak level. Output of QRS detector was examined using a raw R-R interval tachogram output with the beat number on the horizontal axis and R-R time interval on the vertical axis (Figure 11c). From the tachogram, average R-R interval (sec) was displayed (procedure outlined in Campbell-Sills et al, 2006b).



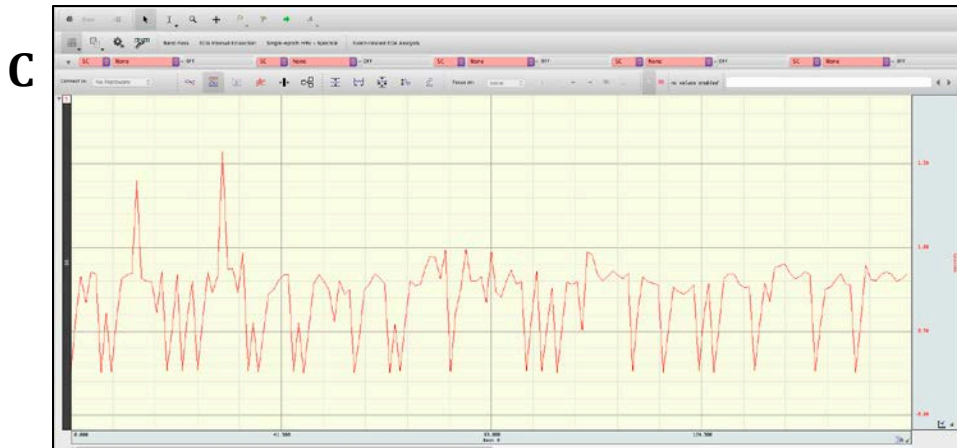


Figure 11. ECG to IBI on Acqknowledge. Panel A: waves are filtered. Panel B: QRS peaks were detected and labeled. Panel C: software generated a tachogram and provided mean R-R interval (in seconds).

State emotion ratings (SER)

Participants were asked after the neutral criticism and anger-evoking criticism to rate their current level of 11 different emotions (i.e. anxiety, sadness, frustration, relaxation, happiness, worry, contentment, fatigue, nervousness, shame, tension) on a 9-point Likert-style scale with 1 = *lowest* and 9 = *highest* as used in similar suppression studies (e.g. Mauss et al., 2007, Gross, 1998). Complete SER can be found in Appendix E. This study was most interested in participants' ratings of frustration and tension.

Data analysis

2 (time-period after neutral-induction, time-period during anger induction) x 2 (suppress emotion, control) repeated-measures ANOVAs were used to examine cardiac responding differences as a result of expressive anger suppression. For each analysis that deemed significant from the omnibus test, a post-hoc analysis was used

to evaluate which pair-wise comparison displayed significant difference. In order to determine magnitude of differences found, effect size analysis was conducted to obtain partial eta squared (partial η^2). Independent-samples t-tests, with equal variances assumed, were used to compare means of two independent groups (i.e. suppress emotion, control) in regards to self-reported frustration and self-reported-tension levels.

RESULTS

Randomization check

To ensure that groups were equal in level of physiological reactivity at baseline, cardiac IBI of control and emotion suppressed groups were compared after receiving identical neutral-induction. Average R-R interval at T1 was .74 s for both control ($SD = .13$) and suppressed ($SD = .15$) individuals, $M_{difference} = .001$, $SE = .06$, $p = .983$ (Table 1). Using an independent samples t-test to compare R-R intervals at T1 between groups revealed no difference in cardiac response, $t(18) = .02$, $p = .98$.

Table 1. Mean IBI of independent groups at T1. IBI of control and suppressed individuals during baseline were equivalent.

Time	<u>Control</u>		<u>Suppressed</u>	
	M	SD	M	SD
T1	0.74	0.13	0.74	0.15

Computed using alpha = .05

Comparing frustration and tension SER at T1 served as a check for equivalent subjective emotions at baseline. For frustration, the control group and suppressed group had an average rating of 2.0 ($SD = 1.77$) and 1.08 ($SD = .29$), respectively. There was no difference in subjective frustration levels between groups, $t(18) = -1.78$,

$p = .09$. For tension, the control group and suppressed group had an average rating of 2.13 ($SD = 1.25$) and 1.92 ($SD = 1.31$), respectively (Table 2). There was also no difference in subjective tension levels between groups at T1, $t(18) = -.36$, $p = .727$.

This check permits clear comparisons of the two groups in regards to cardiac response and SER measurements.

Table 2. Mean ratings of self-report frustration and tension before anger-induction.
Results confirm that participants are equal in subjective emotion level during baseline.

Time	<u>Control</u>		<u>Suppressed</u>	
	M	SD	M	SD
Frustration	2.0	1.77	1.08	.29
Tension	2.13	1.25	1.92	1.31

Computed using $\alpha = .05$

Hypothesis Testing

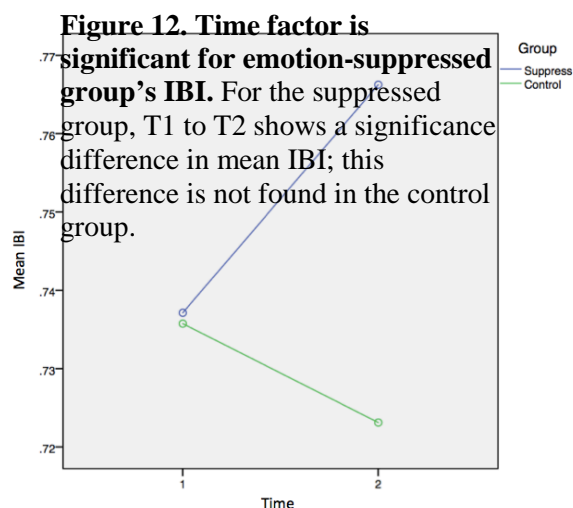
H1: “Smaller cardiac interbeat intervals (greater cardiac response) will be observed in the suppressed group in comparison to the control group, who will have greater interbeat intervals.” Analyses focused on cardiac interbeat interval within-subject factors (i.e. T1, T2) and between-subject factors (i.e. control, suppress). During T2, the mean R-R interval was .72 s ($SD= .12$) for control group participants and .77 s ($SD= .15$) for emotion suppressed participants, $M_{difference} = .04$, $SE = .06$, $p = .51$.

These differences in scores were then examined with a 2x2 (Time[T1, T2] x Group[control, suppressed]) repeated-measures analysis of variance (ANOVA). The analysis revealed no significant difference between groups at T2, $t(18)=.67$, $p=.51$. Moreover, the time variable alone showed no statistical significance, $F(1,18)$, $p=.35$, $\eta_p^2=.49$, however time mattered when taking into account differences between group, $F(1,18)$, $p=.03$, $\eta_p^2=.25$ (Table 3; Figure 12).

Table 3. Comparing mean cardiac IBIs within-subjects and between-subjects. Results revealed no difference in time or group factors, but time mattered depending on what group participants were in. There were two levels of time, one during baseline and a second after anger induction. Time factors were also compared between subjects, that is control and suppress emotion participants.

	F	Sig.	Partial Eta Squared
Time	0.92	0.35	0.05
Group	0.121	0.73	0.12
Time*Group	5.91	0.03	0.25

Computed using alpha = .05



The time x group interaction was further analyzed by conducting two separate post-hoc t-tests were computed comparing T1 to T2 for each group separately. For the control group, data indicates that the R-R intervals from T1 to T2 were not significantly different, $t(7) = 8.25$, $p = .44$. However, suppressed group individuals had statistical evidence that there was a significant difference in R-R intervals between the two time periods, $t(11) = -3.01$, $p = .01$ (Table 4).

Table 4. Post-hoc analysis to evaluate pair-wise comparisons. Significant difference in IBI between time periods for suppressed group but not control group.

	t	df	Sig. (2-tailed)
Control	.825	7	.436
Suppressed	-3.006	11	.012

Computed using alpha = .05

H2: “The suppressed group, in comparison to the control group, will score higher on frustration and tension components in regards to the subjective emotion rating scales.” An independent samples t-test with significance level of 0.05 was conducted to compare levels of frustration at T2. There was no difference in self-report frustration between control and suppressed individuals, $t(18) = -.74$, $p = .47$; $M_{\text{difference}} = -.63$, $SE = .85$ (Table 5) Results also indicated that there was not a significant difference in levels of tension between the groups at T2, $t(18) = -.27$, $p = .79$; $M_{\text{difference}} = -.21$, $SE = .77$ (Table 6).

Table 5. Mean self-report frustration and tension rating following anger-induction Suppressed individuals had lower mean SER ratings for both frustration and tension.

Time	<u>Control</u>		<u>Suppressed</u>		
	M	SD	M	SD	
Frustration		2.62	2.33	2.00	1.45

Tension	2.63	1.77	2.42	1.62
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Computed using alpha = .05

Table 6. Between groups comparison for self-report frustration and tension post anger inducing manipulation. No difference between groups was present for self-report frustration and self-report tension following the anger inducing manipulation.

	t	df	Sig. (2-tailed)
Frustration	-.739	18	.47
Tension	-.272	18	.789

Computed using alpha = .05

DISCUSSION

Examinations of emotion under laboratory conditions have received great attention within the last few decades (Gross, 1998b). Emotion and emotion regulation studies are worthwhile because they provide an improved understanding on how emotional processes affect human functioning, directly and indirectly. Not only was this study the first suppression study to use negative computerized criticism as the method of anger-induction, but it was also the first to show a decrease in cardiac response in response to expressive anger suppression.

The results did not support the H1. Suppressed participants had decreased mean cardiac responding (larger IBIs) compared to control in response to anger induction, opposite of what was expected. This result suggests that suppressing anger expression in this instance may be adaptive in this specific type of situation. That is, it may actually be beneficial not to show anger while receiving negative criticism from others, especially from strangers. At T1, the mean IBI was almost identical,

which was anticipated since all participants, regardless, or group received the same prompt, instructions and feedback.

Results also did not support H2. There is no significant difference in self-report frustration or self-report tension between suppression and paying attention to an anger-evoking induction. There are numerous reasons leading to obtaining an undifferentiated SER for frustration and tension.

The study's anger-induction may have been unsuccessful at evoking the intended emotion, so participants never truly felt anger and therefore were not inhibiting effective expressive suppression of anger. Or there may have been a chance that anger induction occurred, but its intensity was not strong enough to keep the sympathetic system aroused for the 2-minute duration. Therefore, the mean calculated R-R intervals may have included both exposure period, when heart rate increases from baseline rate, and recovery period, when heart rate returns to baseline rate (Figure 13: Campbell-Sills et al., 2006).

Another possibility is that the induction method was more favorable towards having a delayed and prolonged response rather than immediate. Participants could have (if they were hypothetically not debriefed) left the study unaffected by the negative criticism. However, as they ponder on the feedback again later in the day,

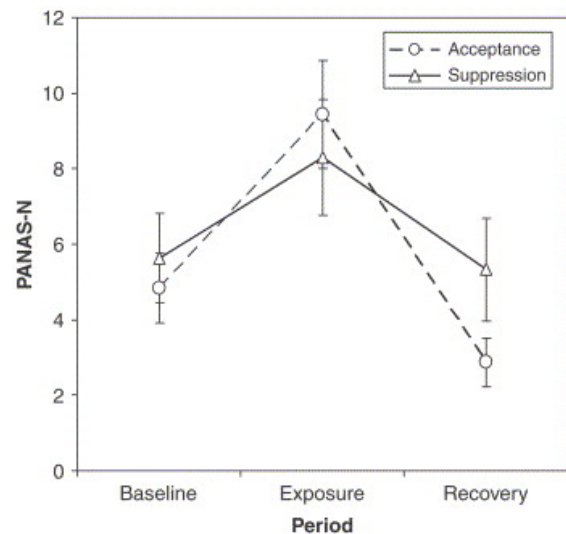


Figure 13. Pre- and post-exposure events in emotion regulation. Nervous system is aroused during exposure period, but returns to rest during recover for both acceptance and suppression.

they may feel increasing levels of frustration and tense which could then lead to an increase in heart rate; however, a measure that is no longer obtainable occurred following the conclusion of the study.

The current study's findings both parallel and contradict results in previous suppression studies. Studies on expressive suppression of sadness and expressive suppression of amusement resulted in increased heart rate (Mauss et al., 2004). On the other hand, when utilizing the same protocol to examine expressive suppression of disgust, a decrease in heart rate was observed (Mauss et al., 2004). None of these studies directly induced anger and thus a clear conclusion explaining the inconsistencies in cardiac activity is difficult to come by. Sympathetic arousal almost always correlates with heart rate, but with the lack of more physiological measurements, a conclusion cannot be made that suppressed participants did not encounter some form of "flight-or-flight response." Combination of sympathetic responses may be specific to the situation. For instance, greater electrodermal responding occurs during sadness suppression (i.e. suppressing negative emotion) but not amusement suppression (i.e. suppressing positive emotion).

Another study conducted by Demaree and colleagues (2006) that involved suppressing facial response to negative emotional stimulus also yielded results that were contradictory to the current result regarding IBI; however, the results supported the current study's findings on subjective emotion ratings. This study concluded that although inhibiting facial response resulted in greater activation of the sympathetic system, supporting Gross, participants nevertheless reported a similar subjective emotional experience (Demaree, Schmeichel, Robinson, Everhart, & Berntson, 2006).

Limitations and future directions

Some study limitations deserve mention. The most critical restraint was the small participant pool of twenty individuals, whereas most suppression studies enrolled a minimum of forty participants (e.g. Campbell-Sills et al., 2006; Gross et al, 1997). Increasing the number of participants may alter (1) the result that there was no significant difference in cardiac activity between groups after anger-induction and (2) the result that there was a significant difference between T1 and T2 of suppressed individuals.

Additionally, participants were asked to rate their current levels of 11 different emotions (i.e. anxiety, sadness, frustration, relaxation, happiness, worry, contentment, fatigue, nervousness, shame, tension); however, they were never specifically asked to rate their level of anger. Including anger on the SER questionnaire would provide insight on whether the anger-induction was effective. The mean subjective anger ratings between T1 and T2 could be compared between groups using repeated measures ANOVA similar to the analysis conducted in the study for IBI. If at T2, the suppressed group exhibited lower levels of anger in comparison to the control group, then the *facial feedback hypothesis* would be supported. The hypothesis argues that skeletal muscle feedback during facial expressions function in emotional experience (McIntosh, 1996; Buck, 1980).

Furthermore, after discovering the true nature of the study during the debrief session, participants ($N=5$) shared that the anger induction stimuli did not truly evoke anger as intended but rather embarrassment and/or humor. This can explain why there were no differences in self-report ratings in tension and frustration between the

two groups. If the individuals, who shared they were not affected by the negative feedback, were removed from the data set, differences in SER responses may be observed.

To improve methodology of the study, (1) an alternative method of inducing anger needs to be considered and (2) more measures of anger need to be included. For example, a longer negative criticism script could be delivered. The current study's script was a short generic paragraph that could be read in a minute or less. Therefore, participants had to remain still and stare at the screen for the remainder of the 2-minute ECG recording period.

Future direction could include: longitudinal studies looking at observe long-term effects of cardiac patterns after prolonged expressive anger suppression, studies that focus various other sympathetic factors, such as perspiration changes due to anger suppression, and studies that involve automatic forms of emotion regulation rather than just effortful forms. This body of research is still a work in progress and only more data will determine the ultimate utility of incorporating emotion regulation into theories of mental and physiological disorders.

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APPENDIX A: IRB

Sincerely,



Richard Bjur, PhD
Co-Chair, UNR IRB
University of Nevada Reno



Janet Usinger, PhD
Co-Chair, UNR IRB
University of Nevada Reno



This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within University of Nevada, Reno IRB's record.

DATE:
TO: Anthony Papa
FROM: University of Nevada, Reno Institutional Review Board (IRB)

PROJECT TITLE: [981479-1] Cardiac Interbeat Interval Effect of Suppressing Anger
REFERENCE #: Social Behavioral
SUBMISSION TYPE: New Project

ACTION: APPROVED
APPROVAL DATE: January 4, 2017
EXPIRATION DATE: January 4, 2018
REVIEW TYPE: Expedited Review
REVIEW CATEGORY: Expedited review # 7

The above-referenced protocol was reviewed and approved by the UNR IRB in accordance with the requirements of the Code of Federal Regulations on the Protection of Human Subjects (45 CFR 46 and 21 CFR 50 and 56). This approval is based on assessment that the research met all applicable regulatory criteria. The research must be conducted in accordance with this approved submission. This submission has received Expedited Review based on applicable federal regulations.

Please prepare your continuing review form at least 4 weeks prior to your expiration date using IRBNet. <https://www.irbnet.org>. Our office will send you a courtesy reminder to that effect. Unless renewed, the IRB only has authority under the federal regulations to allow a study to be open 12 months or less. There is no grace period. The study will be closed on the above stated expiration date unless the IRB receives and approves a continuing review report.

Instructions on preparing a modification or submitting your renewal is located on our web site at <http://www.unr.edu/research-integrity/human-research/irbnet>. Call our office if you have any questions or problems with use of IRBNet software.

Approved Documents

- Advertisement - Free Write Ad (UPDATED: 11/22/2016)
- Application Form - Research Part II Application SOC-ED 033116 (UPDATED: 12/20/2016)
- Consent Form - IRB Consent.docx (UPDATED: 11/22/2016)
- Consent Waiver - IRB Consent Waiver Request Form 051816 (9).docx (UPDATED: 12/20/2016)
- Other - IRB Debrief.doc (UPDATED: 12/20/2016)
- Questionnaire/Survey - Survey Forms.doc (UPDATED: 12/20/2016)
- University of Nevada, Reno - Part I, Cover Sheet - University of Nevada, Reno - Part I, Cover Sheet (UPDATED: 12/16/2016)

If you have any questions, please contact Raymond Avansino at (775) 327-2372 or at ravansino@unr.edu.

NOTE for VA Researchers: You are not approved to begin this research until you receive an approval letter from the VASNHCS Associate Chief of Staff for Research stating that your research has been approved by the Research and Development Committee.

application approval letter

APPENDIX B: Flyer template

UNR PSYCHOLOGY DEPT. FREE WRITE STUDY



2 SONA CREDITS

The purpose of this research study is to learn how different types of students write about certain topics.

Eligibility:

18+ and fluent in English

Time Commitment:

35 - 45 minutes

Location:

Mackay Social Science Building (MSS315)

Sign-up on SONA today!

unr.sona-systems.com

For more information contact the study coordinator:

Nadia Manivong

manivongnadia@gmail.com

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APPENDIX C: IRB-approved consent form



University of Nevada, Reno
 Institutional Review Board
 Approved on: January 4, 2017

University of Nevada, Reno
 Social Behavioral Research Consent Form

Title of Study: Free Write Study
Principle Investigator: Anthony Papa, Ph.D.
Co-Investigators: Nadia Manivong
Study Contact: manivongnadia@gmail.com
 (702) 481-6596
Study ID Number: [981479-1]
Sponsor: None

Introduction

Before you agree to be in this study, please take time to read this form. It explains why we are doing the study; and the procedures, risks, discomforts, benefits and precautions involved. This form may use words that you do not understand. Please ask the researchers to explain anything that you do not understand.

You do not have to be in this study. Your participation is voluntary. Take as much time as you need to decide. If you say yes now but change your mind, you may quit the study at any time. Just let the one of the researchers know you do not want to continue.

Why are we doing this study?

We are doing this study because the university is interested in learning how different types of students write about certain topics.

Why are we asking you to be in this study?

We are asking you to be in this study because you are an adult and you are fluent in English. We expect to enroll 40 people total in this study.

What happens if you agree to be in the study?

First, you will be provided 10 minutes to type a response to a prompt provided on a computer screen. Following, you will respond to a number of questions regarding your current attitudes, thoughts, and emotions; this should take approximately 5 minutes to complete. Next, a second prompt will be given. Again, you have 10 minutes to type a response, followed by a number of questions regarding your current attitudes, thoughts, and emotions. You will then be given a short resting period prior to completing a questionnaire regarding your ability to follow instructions.

During the study, your heart rate will be measured. This involves no physical harm or pain to you. In order to measure heart rate, a small electrode will be placed on each collar bone (one on your left side and one on your right side) and one on your lower left rib. The experimenter is trained on how to place these on all participants in a professional and well-mannered fashion. This set-up will take approximately 10 minutes. If you have questions or concerns about these measurement devices, you may address them with the experimenter or contact Dr. Anthony



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Papa (see below for contact information). There will also be a short debriefing session at the end of the study that will take approximately 5 minutes.

How long will you be in the study?

The study will take about **35-45 minutes** of your time; you'll participate on this one occasion – there are no additional portions of the study at a later time.

What happens if you do not want to be in the study?

Nothing will happen if you decide not to be in this study. You can inform the experimenter after this consent form is reviewed or at any time throughout the study. There are no penalties to you if you decide to terminate your participation in the study.

Is there any way being in this study could be bad for you?

If you agree to be in this study, there are a few minimal risks. Potential risks of participating include the possibility that discussing your emotional reactions to the tasks may be upsetting. The researcher is aware of this risk and is prepared to help you should the situation arise. All participants in the study are given the following information: if you wish to speak to a counselor, you may contact UNR Counseling Services, Thompson Building 202, at 775-784-4648, or you can send an email to counseling@unr.edu. You may also call 775-554-0492 for the after-hours Crisis Line whether or not you are a UNR student. If you have any concerns or complaints, you may notify the researcher or the UNR Research Integrity Office at 775-327-2368.

Will being in this study help you in any way?

Being in this study may not help you but you may aid in psychology's understanding the different ways students write about certain topics.

How will we protect your private information and the information we collect about you?

We will treat your identity with professional standards of confidentiality and protect your private information to the extent allowed by law. We will do this by not keeping your name connected with any of the information you give us. Instead, your name will be given a participant number. A master list linking your name and your participant number will be kept on a password protected computer in a locked room and can only be accessed by the Principal investigator and the co-investigator. Additionally, we will not use your name or other information that could identify you in any reports or publications that result from this study.

Who will know that you are in in this study and who will have access to the information we collect about you?

The researchers, the US Department of Health and Human Services (DHHS), and the University of Nevada, Reno Social Behavioral Institutional Review Board, will have access to your study records.

Your information is kept confidential. However, there are a few instances in which confidentiality may be broken. If you were to tell us that you planned to harm yourself, harm others, in instances of child or elder abuse, or if a court order the information by subpoena, we would be required by law to report that information.



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Will it cost you anything to be in the study?

There will be no costs to you to be in the study.

Will you be paid for being in this study?

You will be compensated for your time with 2 Psychology SONA course extra credit for participating in this research study.

What happens if you agree to be in the study now, but change your mind later?

You do not have to stay in the study. You may withdraw from the study at any time by simply informing the experimenter that you no longer wish to be in the study. There is no penalty to you if you decide to drop out.

What if the study changes while you are in it?

If anything about the study changes or if we use your data in a different way, we will tell you and ask if you want to stay in the study. We will also tell you about any important new information that may affect your willingness to stay in the study.

Who can you contact if you have questions about the study or want to report an injury?

At any time, if you have questions about this study or wish to report an injury that may be related to your participation in this study, contact Dr. Anthony Papa at (775) 682-8666 or Nadia Manivong at (702) 481-6596.

Who can you contact if you want to ask about your rights as a research participant?

You may ask about your rights as a research participant or talk (anonymously if you choose) to the University of Nevada, Reno Social Behavioral Institutional Review Board by calling (775) 327-2368 or sending a note from the *Contact Us* page of this website: <http://www.unr.edu/research-integrity>.

Do the researchers have monetary interests tied to this study?

The researchers and/or their families do not have monetary interests tied to the study.



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Agreement to be in study

If you agree to be in the study, please sign this document. We will give you a copy of the document to keep.

By signing the document you are saying:

- You agree to be in this study.
- We talked with you about the information in this document and answered all of your questions.

You know that:

- You may stop participating in the research at any time.
- You may call the University office in charge of research at (775) 327-2368 if you have any questions about the study or about your rights.

 Participant's Name Printed

 Signature of Participant

 Date

 Signature of Person Obtaining Consent

 Date

APPENDIX D: Debriefing Statement

In our society, it is almost universally taken at face value that individuals will feel or express their emotions in an appropriate way. Scientifically, research suggests that some methods for regulating or managing how we feel can be effective ways to deal with difficult emotions. Positive efforts to deal with strong emotions have been associated with healthy psychological outcomes.

The goal of this study is to examine suppression of the expression of anger and how it affects individuals' cardiac activity. Specifically, we are interested in how thinking about situations in more neutral ways, allowing ourselves to fully experience emotions, may make it easier to deal with negative emotions such as anger. This is why we asked you to respond in a certain way in response to receiving negative criticism. Some participants were asked to focus on suppressing facial expression, and others were asked to simply pay attention in response to the same criticism you encountered. We can later compare all participants' responses on emotional and physiological measurements in response to those tasks.

In this study, we are interested in the suppression of anger suppression and how it affects cardiac interbeat intervals (IBI). However, monitoring one's emotions can actually change one's emotional experience. Thus, it was necessary to use the cover story of conducting research for "Different Writing Topics" to avoid any self-monitoring that may result from divulging the true nature of the study. The cover story was very carefully written—very rarely do participants "see through" it.

We realize that such deception may result in feelings of anger or embarrassment at having been misled, but hope that this explanation clears up any negative feelings you might have. We also realize that the receiving negative criticism may cause psychological discomfort. If you have any questions or concerns, please ask the experimenter or email Dr. Anthony Papa at apapa@unr.edu or phone (775) 682-8666.

Also, if you would like to speak with a counselor, you may contact UNR student Counseling Services, Thompson Building 202, at 775-784-4648 or by emailing counseling@unr.edu. If you are not a UNR student, the experimenter will provide with information regarding counseling services in the community. You may also call the after-hours Crisis Line at 775-554-0492.

Your participation today may further emotion research by investigating emotion regulation strategies and outcomes that occur in everyday situations. In exchange for your participation today, you will be compensated with 2 SONA Psychology research study credits.

Also, please do not discuss this experiment with others—to obtain valid results it is essential that future participants are not informed about the study.

APPENDIX E: Subjective emotion rating (SER) questionnaire

The following items appear here like they do on the participant's computer screen in the experiment, but each item is presented on its own consecutively. When a participant finishes answering one item, the screen automatically switches to the next item.

All of the following items are rated on a scale of 1-9. 1="low" and 9="high".

1. Please rate the level of anxiety you feel now.
1 2 3 4 5 6 7 8 9
2. Please rate the level of sadness you feel now.
1 2 3 4 5 6 7 8 9
3. Please rate the level of frustration you feel now.
1 2 3 4 5 6 7 8 9
4. Please rate the level of relaxation you feel now.
1 2 3 4 5 6 7 8 9
5. Please rate the level of happiness you feel now.
1 2 3 4 5 6 7 8 9
6. Please rate the level of worry you feel now.
1 2 3 4 5 6 7 8 9
7. Please rate the level of contentment you feel now.
1 2 3 4 5 6 7 8 9
8. Please rate the level of fatigue you feel now.
1 2 3 4 5 6 7 8 9
9. Please rate the level of nervousness you feel now.
1 2 3 4 5 6 7 8 9
10. Please rate the level of shame you feel now.
1 2 3 4 5 6 7 8 9
11. Please rate the level of tension you feel now.
1 2 3 4 5 6 7 8 9

APPENDIX F: Emotion process (EPro) questions

The following items appear here like they do on the participant's computer screen in the experiment, but each item is presented on its own consecutively. When a participant finishes answering one item, the screen automatically switches to the next item.

The following questions concern how you reacted to the film clip you just viewed. Please answer them using a scale of 1-9. 1="not at all" and 9="extremely".

1. I tried to ignore any negative emotions I felt while reading my feedback.
1 2 3 4 5 6 7 8 9
2. I tried not to pay attention to the feedback.
1 2 3 4 5 6 7 8 9
3. I tried to alter my emotional reactions while reading the feedback.
1 2 3 4 5 6 7 8 9
4. I focused on what was happening while reading the feedback.
1 2 3 4 5 6 7 8 9
5. I tried to feel more positive while reading the feedback.
1 2 3 4 5 6 7 8 9
6. I thought that I should be able to enjoy the feedback more than I did.
1 2 3 4 5 6 7 8 9
7. I tried to alter how the feedback made me feel inside.
1 2 3 4 5 6 7 8 9
8. I monitored how I felt while reading the feedback.
1 2 3 4 5 6 7 8 9
9. I made an effort to feel less negative while reading the feedback.
1 2 3 4 5 6 7 8 9
10. I tried to alter my facial expressions in response to reading the feedback.
1 2 3 4 5 6 7 8 9
11. I think I would remember a lot of details about my feedback.
1 2 3 4 5 6 7 8 9