



Experiencing and regulating sadness: Physiological and cognitive effects

Jennifer L. Robinson^{a,*}, Heath A. Demaree^b

^a Department of Psychiatry, University of Texas Health Science Center at San Antonio, 7703 Floyd Curl Drive, MC 7792, San Antonio, TX 78229, USA

^b Department of Psychology, Case Western Reserve University, Mather Memorial Building, Room 109, 11220 Bellflower Road, Cleveland, OH 44106-7123, USA

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ABSTRACT

No prior study has examined the two most prominent response-focused regulation strategies (suppression and exaggeration) using a within-subjects design. Utilizing this design allows for a direct comparison of physiological patterns and cognitive impairment associated with such efforts. One hundred and nine participants were asked to view a series of three films, each preceded by a 10-second instructional slide which indicated the regulation strategy they were to perform (natural-watch, exaggerate, or suppress). Exaggeration was associated with increased sympathetic activation as indicated by an increase in galvanic skin conductance level (GSL) and shortened pre-ejection period (PEP). Suppression, much like the natural-watch condition, was associated with greater sympathetic withdrawal (i.e., decreased GSL, longer PEP). Both suppression and exaggeration led to reduced memory for the emotional movie, with exaggeration causing more impairment than suppression. Results suggest that exaggeration and suppression not only have very different behavioral manifestations, but physiological outcomes as well when utilized during a sad context.

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1. Introduction

Emotion dysregulation is a hallmark feature of all Axis II and over half of the nonsubstance related Axis I disorders of the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 1994). While deficits in affective processing and modulation (e.g., displaying inappropriate levels of affect) have implications for social dysfunction (e.g., healthy emotion regulation is vital for inter- and intrapersonal relations), less obvious is the physiological stress that is imposed on the regulator. For example, problems with affect modulation have been associated with a significantly greater incidence of Coronary Heart Disease (CHD) (Barrick, 1999; Denollet et al., 1996; Murray & Lopez, 1997; Sher, 2001), the number one leading cause of death in the United States according to the Centers for Disease Control and Prevention (Centers for Disease Control, 2006). Because of their relationship to both cardiovascular and mental health issues, it is important to study different emotion regulation techniques (e.g., suppression and exaggeration) and their emotional, cognitive, and autonomic effects.

Research shows that different emotion regulation strategies produce distinct physiological patterns. Gross (2001) defines two types of emotion regulation strategies—antecedent- and re-

sponse-focused. Antecedent strategies are those that occur prior to activating one's natural response tendencies (e.g., reappraisal), while response-focused refers to those regulation strategies that are initiated post-response. The two most frequently studied response-focused strategies are suppression (i.e., inhibition of emotionally expressive behavior) and exaggeration (i.e., any attempt to embellish one's affective expression to an emotional experience). Both sets of strategies are imperative to normal social development. For example, Thompson, Connell, and Bridges (1988), Thompson (1994, 1998) propose that emotion regulation, including the ability to display appropriate affect, is part of a larger construct termed 'emotional competence' that is necessary for the capacity to deal with complex emotions. Furthermore, this construct becomes a critical component during parenting, when emotional competence begins to affect the rearing of a child, impacting their attachment and socialization.

Although exaggeration and suppression produce vastly different behavioral output, both are thought to cause increased sympathetic arousal when compared to naturally-watching the same stimulus. For example, suppressors show greater increases in finger pulse amplitude, finger temperature, skin conductance, eye blinks, and greater decreases in pulse to finger transmission time (Gross, 1998; Gross & Levenson, 1993, 1997), all indicators of heightened sympathetic response. Demaree et al. (2006) further assessed the sympathetic effects at the myocardium by including pre-ejection period (PEP) as one of their physiological measure-

* Corresponding author. Fax: +1 210 567 1291.

E-mail address: robinsonj3@uthscsa.edu (J.L. Robinson).

ments. PEP is the amount of time for isovolumetric contraction, and the shortening of PEP is an indicator of increased cardiac sympathetic control. Results showed that both suppression and exaggeration of a disgust-eliciting film clip produced significant decreases in PEP, whereas natural viewing did not.

Because exaggeration and suppression have opposite behavioral output, it is perhaps surprising that the physiological consequences are similar. For example, Schmeichel, Demaree, Robinson, and Pu (2006) studied the behavioral and physiological patterns associated with exaggeration and found cognitive impairment as a result of this regulation strategy. Furthermore, exaggeration of either an amusement-eliciting or disgust-eliciting film leads to increased skin conductance relative to watching an emotional stimulus naturally (Demaree, Schmeichel, Robinson, & Everhart, 2004; Lanzetta, Cartwright-Smith, & Kleck, 1976; Vaughan & Lanzetta, 1981; Zuckerman, Klorman, Larrance, & Spiegel, 1981). Demaree et al. (2006) also found decreased interbeat interval (IBI; the inverse of heart rate) in a group asked to exaggerate their emotional response, a finding that was attributed to increased muscle contraction. Although exaggeration and suppression show similar physiological reactivity patterns, no study to date has examined both response-focused strategies using a within-subjects design to account for individual differences in baseline physiology as well as differences in affective style.

In addition to physiological stress, response-focused regulation strategies may produce cognitive deficits. For example, Richards and Gross (2000) looked at incidental memory for an emotional film among people asked to either suppress their facial reaction or to watch the film “naturally”. Those in the suppress condition performed significantly worse on the subsequent memory task relative to those in the natural-watch condition. A second study revealed similar results. Participants viewed slides and were asked about verbal and non-verbal aspects of the slides. Suppressors, compared to natural-watchers and reappraisers, showed impaired memory ability on the verbal task. Furthermore, habitual suppression may lead to impaired memory not only for stimuli presented during a regulation task, but also for daily events (Gross & John, 2003). One theory behind such memory impairment is that regulating emotion during an event requires divided attention. Thus, the regulation process (modifying thoughts, feelings, or behaviors) may take attentional resources that otherwise would have been directed toward the stimulus (DePaulo, Blank, Swaim, & Hairfield, 1992; Ellis & Ashbrook, 1989; Wegner, 1994). Since exaggeration is also a response-focused strategy, it would be expected to cause impaired performance on ensuing cognitive tasks, specifically those measuring memory for the stimulus. However, no studies have examined the effects of exaggerating emotions on memory.

The goal of the current project was to examine whether exaggeration and suppression have similar physiological profiles using a within-subjects design. We sought to extend the literature on emotion regulation by including discrete measures of both parasympathetic and sympathetic arousal at the level of the myocardium, in addition to more traditional physiological measurements such as electrodermal activity. Furthermore, we wanted to examine the effects of these response-focused regulation strategies on memory performance using stimuli that have been known to reliably induce sadness (Robinson & Demaree, 2007). We had two main hypotheses:

- (1) Exaggeration and suppression will be marked by increased sympathetic arousal as measured by decreased PEP and increased electrodermal activity (as measured by galvanic skin conductance level [GSL]).
- (2) Relative to those who natural view the emotional movie, those who exaggerate and suppress their facial responses will have impaired memory for the movie.

2. Experiment overview

Participants came to the Case Affective Neuroscience Laboratory and were asked to read and sign an Informed Consent Form, approved by the Case Western Reserve University Institutional Review Board. After consent, the participant was given an overview of the experiment and baseline emotional state was assessed. Participants were told that they would view a series of three films, preceded by an emotion regulation instruction (either “natural-watch,” “suppress,” or “exaggerate”). We collected self-report, behavioral, and physiological reactions to the film clips. Each clip was preceded and succeeded by a 2 min slide that read “Please sit still and relax”. These served as baseline (Time 1) and recovery (Time 3) periods. Reactivity, as discussed in the upcoming sections, was defined as the physiological reactivity during Time 2 (i.e., during film presentation)—Time 1 (i.e., 2 min baseline preceded film presentation). Following the completion of each film clip, participants completed a memory test and a self-report questionnaire regarding their affective experience. The memory task was comprised of ten questions designed to assess the participant’s ability to retain social information presented during the video (e.g., “what were the parents’ names?”). Finally, after the completion of all movie clips, participants were asked to fill out a post-experiment questionnaire regarding how much effort they put forth during each regulation strategy.

3. Method

3.1. Participants and design

This protocol was a within-subjects design. One hundred and nine undergraduates from a private, Midwestern University participated in the research. Seven participants were excluded due to physiological artifacts (4) or incomplete questionnaire data (3), leaving 102 participants. Physiological artifacts were identified by incomplete ECG data (e.g., electrodes fell off). These data were not systematically related to any study measures. The fifty-two females and 50 males were randomly assigned into 6 groups (3 regulation techniques that were counterbalanced) of 17 participants each.

3.2. Procedure

The experimenter described the study as an investigation of emotion regulation. Participants were told they would watch a series of short, emotion-eliciting film clips which would be preceded by a 10 s slide telling them how to watch the film clip. Specifically, participants were told that they would see the following instructional slides during the experiment: “natural-watch”, “suppress”, and “exaggerate” (see the following for the specific instructions). The three instructional slides were described in detail prior to the experiment. For demonstration purposes, the experimenter provided examples of each of the regulation techniques. The experimenter also explained that participants would be attached to electrodes so that physiological responses to the film clip could be recorded, and that the participants would be asked to fill out questionnaires following the completion of each film clip.

3.3. Independent variables

3.3.1. Emotion-eliciting stimuli

Participants saw three sad film clips, each depicting a child with a terminal or chronic illness taken from a regionally broadcast charity-fundraiser. The clips have been used in previous research

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