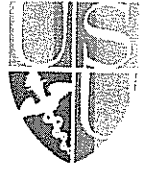


EMOTION REGULATION AND NEGATIVE AFFECT:
LABORATORY AND FIELD INVESTIGATIONS

by

Jessica M. MacIntyre, B.S.

Thesis submitted to the Faculty of the
Medical and Clinical Psychology Graduate Program
Uniformed Services University of the Health Sciences
In partial fulfillment of the requirements for the degree of
Masters of Science 2015



April 2, 2015

APPROVAL SHEET

Title of Dissertation: "Emotion Regulation and Negative Affect: Laboratory and Field Investigations"

Name of Candidate: Jessica M. MacIntyre, Master of Science
in Medical and Clinical Psychology, Date 04/02/2015

THESIS AND ABSTRACT APPROVED:

[Redacted Signature]

DATE:

4/08/15

Dr. Andrew Waters
Department of Medical and Clinical Psychology
Committee Chairperson

[Redacted Signature]

4/08/15

Dr. Andrew Waters
Department of Medical and Clinical Psychology
Thesis Advisor

[Redacted Signature]

4/2/15

Dr. Marian Tenofsky-Kraff
Department of Medical and Clinical Psychology
Committee Member

[Redacted Signature]

4/5/15

Dr. Tracy Strocchio
Department of Medical and Clinical Psychology
Committee Member

Name
DEPARTMENT OF PROGRAM NAME
Committee Member

ACKNOWLEDGMENTS

I am exceptionally appreciative for my advisor, Dr. Andrew Waters. The time, energy, and support he contributed to completing this project were invaluable.

Additionally, I would like to thank Dr. Aimee Ruscio for allowing me to use data from her dissertation project. I would also like to thank the participants of the original study for their time, as well as the past and current members of the LOCI lab who worked to collect and organize the data used in this project.

COPYRIGHT STATEMENT

The author hereby certifies that the use of any copyrighted material in the thesis manuscript entitled: Emotion Regulation and Negative Affect: Laboratory and Field Investigations is appropriately acknowledged and, beyond brief excerpts, is with the permission of the copyright owner.

A solid black rectangular box redacting the author's signature.

Jessica M. MacIntyre

April 8, 2015

ABSTRACT

Emotion Regulation and Negative Affect: Laboratory and Field Investigations

Jessica M. MacIntyre, B.S.

Thesis directed by: Andrew J. Waters, Ph.D., Associate Professor, Department of
Medical and Clinical Psychology

Deficits in emotion regulation abilities have been associated with psychopathology, including addiction. Such deficits may provoke drug use by increasing the intensity and lability of negative affect. The primary goal of this study was to investigate the relationship between difficulties in emotion regulation ability and negative affect both in the laboratory and the field. The study was a secondary data analysis. The parent study (Ruscio, 2013) was “a parallel group randomized controlled trial of a brief mindfulness meditation (Brief-MM) intervention delivered to smokers on a Personal Digital Assistant (PDA) in the field. Adult community smokers (N = 44) were randomly assigned to a Brief-MM (n = 24) or Control (sham meditation training; n = 20) group.” All participants carried a PDA for two weeks and were instructed to initiate 20 minutes of meditation (or control) training on the PDA once per day and to complete an assessment of negative affect using a 10-item version of the Positive and Negative Affect Schedule (PANAS). Additionally, they were prompted to complete the same assessments at

random times up to four times per day. Thirty-seven participants contributed EMA data and completed in total 1874 assessments. At each of three laboratory visits, participants completed the Difficulties in Emotion Regulation Scale (DERS) and the PANAS. DERS scores were fairly stable across assessments ($ICC = .73$). Participants with higher DERS scores reported more negative affect at lab visits. In addition, when a participant reported a higher DERS score than their average, they reported higher negative affect. Participants with high DERS scores at baseline reported higher negative affect in the field, and also more labile negative affect. The maximum level of negative affect of participants with higher DERS scores was higher than those with lower DERS scores. Overall, the findings suggest the presence of state- and trait-like aspects of emotion regulation and that emotion regulation abilities are related to the intensity and lability of negative affect.

TABLE OF CONTENTS

LIST OF TABLES	viii
LIST OF FIGURES.....	ix
CHAPTER 1: General Introduction	2
Emotion Regulation.....	2
Working Definition	2
Emotion Dysregulation	2
Emotion Versus Affect.....	3
Emotion Regulation and Psychopathology	4
Current State of Emotion Regulation and Affect Research	4
Specific Emotion Regulation Techniques	5
Shortcomings in Current Research.....	5
Trait Versus State Emotion Regulation.....	6
Ecological Momentary Assessment	7
EMA and Affect	8
Emotion Regulation and Smoking	8
Summary	9
CHAPTER 2: Introduction to the Current Study	10
Rationale for Current Study	10
Specific Study Aims and Hypotheses	10
Specific Aim 1	10
Hypothesis 1.1	11
Hypothesis 1.2.....	11
Hypothesis 1.3.....	11
Specific Aim 2.....	11
Hypothesis 2.1	11
Hypothesis 2.2	12
Hypothesis 2.3	12
CHAPTER 3: Methods.....	13
Recruitment Procedures	13
Inclusion and Exclusion Criteria	13
Study Procedures	14
First Laboratory Visit	14
EMA Procedures	15
Second Laboratory Visit.....	15
Third Laboratory Visit	16
Measures.....	16

Laboratory Measures	16
Positive and Negative Affect.....	16
Emotion Regulation.....	16
EMA Measures.....	17
Positive and Negative Affect.....	17
Analytic Plan	17
Sample Characteristics	17
Demographic Information	17
Field Assessment Information.....	18
Primary Analyses	19
Specific Aim 1.1.....	19
Specific Aim 1.2.....	20
Specific Aim 1.3.....	20
Specific Aim 2.1.....	20
Specific Aim 2.2.....	21
Specific Aim 2.3.....	21
CHAPTER 4: Results.....	23
Sample Characteristics	23
Demographic Information	23
Field Assessment Information.....	23
Primary Analyses	24
Specific Aim 1.1.....	24
Specific Aim 1.2.....	24
Specific Aim 1.3.....	25
Specific Aim 2.1.....	25
Specific Aim 2.2.....	26
Specific Aim 2.3.....	27
Chapter 5: Discussion.....	29
Association Between Emotion Regulation and Affect in the Laboratory	29
Association Between Emotion Regulation and Affect in the Field	30
Strengths.....	31
Limitations	32
Implications and Future Directions	32
Appendix A: Self-Report Measures	50
Demographics Questionnaire	50
Positive and Negative Affect Schedule (PANAS)	54
Difficulties in Emotion Regulation Scale (DERS).....	55
Appendix B: USUHS IRB Approval Letter	
Appendix C: Informed Consent Document.....	58
REFERENCES.....	63

LIST OF TABLES

Table 1. Summary of Original Study Procedures	35
Table 2. CONSORT flow diagram from the original study.....	36
Table 3. Demographic information for participants who completed at least one EMA assessment (N = 37).	37
Table 4. Demographic information for participants who completed at least one EMA assessment broken down by high (n = 18) and low (n = 19) DERS at baseline.	38
Table 5. Assessment statistics for participants who completed at least one EMA assessment (N = 37).	39
Table 6. Assessment information for participants who completed at least one EMA assessment broken down by high (n = 18) and low (n = 19) DERS at baseline.	40

LIST OF FIGURES

Figure 1. Comparison of negative affect for a high DERS subject (subject 21, black line) and a low DERS subject (subject 4, grey line) across EMA assessments.	41
Figure 2. Scatterplot of mean negative affect and mean DERS scores in the laboratory. DERS scores can range from 36 to 180 with higher scores indicating more difficulties with emotion regulation.	42
Figure 3. Scatterplot of negative affect and DERS deviation scores at each laboratory visit. Negative deviation scores indicate lower than mean DERS score (better emotion regulation) while positive scores indicate a higher than average score.	43
Figure 4. Mean negative affect at pre-max, max, and post-max time points by group. High DERS group is shown in black and low DERS group is shown in light grey.	44
Figure 5. Breakdown of maximum negative affect score reported. High DERS group is shown in black and low DERS group is shown in light grey.	45
Figure 6. Breakdown of jumps, drops, and no change across all 1874 EMA assessments. High DERS group is shown in black and low DERS group is shown in light grey.	46
Figure 7. Average absolute magnitude of change across all EMA assessments for high and low DERS groups.	47
Figure 8. Scatterplot illustrating the relationship between baseline DERS score and average jump from pre-max to max assessments. High DERS group is shown in black and low DERS group is shown in light grey.	48
Figure 9. Number of instances where PANAS negative affect score was at least 20 for each participant. High DERS group is shown in black and low DERS group is shown in light grey.	49

CHAPTER 1: General Introduction

EMOTION REGULATION

Working Definition

The working definition of emotion regulation used for this thesis was proposed by Kim Gratz and Lizabeth Roemer and presented in their 2004 paper on the development and validation of the Difficulties in Emotion Regulation Scale (DERS, 15). While a number of definitions of emotion regulation exist in the literature, the multidimensional conceptualization is one of the more specific definitions and has been used across psychological research domains, including substance abuse and addiction (11). The multidimensional conceptualization specifies four dimensions of emotion regulation:

- (a) awareness, understanding, and acceptance of emotions; (b) ability to engage in goal-directed behaviors and inhibit impulsive behaviors when experiencing negative emotions; (c) flexible use of situationally appropriate strategies to modulate the intensity and/or duration of emotional responses rather than to eliminate emotions entirely; and (d) willingness to experience negative emotions as part of pursuing meaningful activities in life (42-43; 15).

This definition is used primarily because of the clarity and thoroughness of the definition. It includes both cognitive and behavioral responses to emotion and emphasizes the importance of using these strategies to engage in goal-directed responses. Additionally, this definition corresponds to the DERS, one of the primary measures used to assess emotion regulation both for the current project as well as within the field in general.

Emotion Dysregulation

Emotion dysregulation can be conceptualized as the lack of emotion regulation. For example, Gratz states that a deficiency in skill for any one part of the definition of emotion regulation provided above indicates emotion dysregulation (15). Marsha Linehan was one of the first researchers to focus on emotion dysregulation specifically. In her work with chronically suicidal females, Linehan discovered that the majority of patients she was seeing had extreme difficulties with emotion regulation. She describes emotion dysregulation as “due to high emotional vulnerability plus an inability to regulate emotions. Characteristics of emotional vulnerability include high sensitivity to emotional stimuli, emotional intensity, and slow return to baseline” (25). In her paper conceptualizing emotion dysregulation in the context of nonsuicidal self-injury, Gratz clarifies that emotion regulation is the ability to respond to negative emotions in an adaptive way regardless of intensity or reactivity (13). Thus, an individual may have strong, volatile negative affect, but still be able to regulate thoughts and behaviors. An investigation of these hypotheses was one of the primary areas of interest for this study. The affective patterns associated with high and low emotion regulation abilities are not well understood at this point. As the hypotheses below indicate, we expected results to be in line with Linehan’s hypothesis such that difficulties with emotion regulation would be associated with intense, unstable negative affect.

Emotion Versus Affect

It is important to note the difference between affect and emotion. While this question is an ongoing debate in the literature and a full discussion is beyond the scope of this thesis, working definitions for both are provided here. Affect is the individual’s current experience measured along two dimensions, valence (positive to negative) and

arousal (high to low, 32). Emotion, on the other hand, is a discrete state such as anger, happiness, or fear, where the affect is tied to a situational cause (30).

Emotion Regulation and Psychopathology

Deficits in emotion regulation have been associated with an extensive variety of psychological difficulties. There is a strong, well-researched relationship between smoking and psychiatric disorders (12), which are associated with deficits in emotion regulation. There is a particularly robust relationship between smoking and depression (2; 29). One longitudinal study found that dysregulation at age eight was associated with a number of poor psychological outcomes at age 19 including mood and substance use disorders, as well as poor overall functioning (38). A study conducted with a population of U.S. military service members found that difficulties with emotion regulation mediated the relationship between posttraumatic stress disorder (PTSD) and a number of negative health outcomes, including depression and poor social adjustment (13). These findings were corroborated by a study conducted in a large sample of adults that found emotion dysregulation to be significantly associated with a number of negative psychiatric outcomes including posttraumatic stress symptoms, alcohol and drug abuse, depression, poor adaptive functioning, and suicide history (20). Additional studies show associations between emotion dysregulation and eating disorders (41), nonsuicidal self-injury (27), and generalized anxiety disorder (7). More generally, poor emotion regulation is associated with increased levels of anger and hopelessness (26).

Current State of Emotion Regulation and Affect Research

There have been two primary areas that emotion regulation research has focused on in relation to affect: the association with psychopathology and symptomatology and

the examination of specific emotion regulation techniques. A brief overview of the research in both areas is presented below.

Specific Emotion Regulation Techniques

Many studies have examined the effectiveness of specific emotion regulation techniques. For example, one study induced negative mood in a sample of depressed patients with instructions to either wait, reappraise the situation, accept the negative emotions, or use self-compassion (22). Researchers then compared the reduction of negative mood across conditions and found that each of the specific techniques (reappraisal, acceptance, and self-compassion) were more effective at reducing negative feelings than the control condition. Studies such as this have contributed to a large body of research examining the relative effectiveness of various strategies for regulating affect, particularly negative affect. Several large meta-analyses such as Webb, Miles, and Sheeran (3) have used this type of study to examine the overall effectiveness of various emotion regulation strategies at altering affect.

Shortcomings in Current Research

The body of literature focusing on emotion regulation is expanding, yet several shortcomings exist. First, the tremendous variety in terms used (e.g., affect vs. emotion, self regulation vs. emotion regulation vs. affect regulation, etc.) makes it difficult to create a comprehensive search and understanding of the field. Similarly, a variety of measures are used to assess emotion regulation and with each measuring different cognitions, behaviors, and conceptualizations of the term. Much of this variability in terms, assessments, and conceptualizations stems from the fact that there is still ongoing debate about what emotion regulation constitutes (16).

The current study sought to specifically address two areas where research in the field is somewhat lacking. First, much of the current literature has utilized laboratory studies, which, while very useful, does not necessarily generalize to real world settings. Second, the association between emotion regulation ability and real-time affective patterns remains unclear. As mentioned above, Linehan suggests that individuals with poor emotion regulation skills should show increased intensity and frequency of negative affect with a slow return to baseline (25). Gratz clarifies this by suggesting that intensity and frequency do not necessarily indicate dysregulation. Rather, an individual may be well regulated, but still have intense and reactive negative affect (13). These hypotheses have yet to be thoroughly investigated. Using ecological momentary assessment techniques, this study aimed to address these gaps by providing a real-time look at the affective patterns for individuals with high and low emotion regulation.

Trait Versus State Emotion Regulation

Emotion regulation is a process and thus, by nature, it is constantly changing. Nevertheless, when discussed either clinically or scientifically, emotion regulation is usually classified as a stable construct and individuals are labeled as having strong or weak emotion regulation abilities, for example. Some research touches on the more changeable aspects of emotion regulation, particularly in reference to associated psychopathology. For example, one study found that healthy individuals and those who had recovered from an eating disorder had significantly better emotion regulation abilities than individuals with an acute eating disorder (8). The authors suggest that this indicates that recovery from an acute eating disorder may be associated with an improvement in emotion regulation difficulties. One other study found that general emotion regulation

abilities and situational factors influenced the use of emotion regulation strategies in a stressful situation (10).

Given that emotion regulation is a process that is constantly occurring, it is reasonable to expect that immediate situational and contextual factors may influence an individual's emotion regulation capabilities at any given point (24). Therefore, while an individual may have a general, overall level of emotion regulation ability (i.e. trait emotion regulation), his moment-to-moment emotion regulation ability may vary depending on his own current experience (i.e. state emotion regulation). Thus far, this notion has not been explored in the literature and it offers a new direction from which to explore emotion regulation. This area will be one of the primary areas of exploration for the current study.

ECOLOGICAL MOMENTARY ASSESSMENT

Ecological momentary assessment (EMA) techniques utilize mobile technology to measure phenomena as they occur in an individual's real-world environment. Assessments may occur randomly, at scheduled times, and/or when a participant initiates an assessment. EMA techniques have provided an innovative strategy for the measurement of thoughts and behaviors as they occur in the natural environment. Rather than relying upon retrospective reports, data can be collected in real time while individuals are experiencing the phenomenon of interest. This method of data collection is particularly useful because it eliminates recall biases and enhances validity as data is gathered as it occurs in participants' daily lives (35). In addition, data is collected at multiple time points so that changes over time can be considered. The real time, repeated data collection available with EMA is particularly useful in investigating constantly

changing psychological states, such as affect.

EMA and Affect

EMA has been used to measure affect in a variety of studies, and several conditions have been associated with emotional instability including borderline personality disorder (17), smoking relapse (43), depression (37), and bulimic symptomatology (9). Not only has EMA been validated as a tool for assessing affect, researchers have found that EMA measurements of affect better predict outcome behaviors, such as binge eating episodes, when compared to retrospective self-reports of affective lability (34). This suggests that EMA reports of affect are more accurate than retrospective reports and thus better suited to investigating the relationship between affect and trait emotion regulation.

EMOTION REGULATION AND SMOKING

Participants in this study were current smokers. Research has found a significant role of emotion regulation in addictive behaviors (23). A growing body of research has revealed that individuals with deficits in emotion regulations are at greater risk of addictive disorders and that individuals with poor emotion regulation find it more difficult to abstain (5). A large body of theory and research suggests that individuals often smoke cigarettes as a means of controlling mood (21; 33; 39), particularly as a way to reduce negative affect (18; 40). The negative affect model of tobacco use disorders suggests specifically that the initiation and maintenance of smoking is partly due to the frequent experience of high levels of negative affect and an inability to regulate this affect (6). Data support this relationship, finding that smokers frequently smoke in response to negative affect (4; 28). Additionally, researchers utilizing EMA techniques

found that sharp increases in negative affect have been associated with smoking relapse during cessation attempts (36). One study specifically examining emotion regulation in a smoking sample found that one aspect of emotion regulation, emotional nonacceptance, was significantly associated with recent smoking in a sample of depressed smokers (1). Given the well-researched relationship between negative affect and behavioral outcomes (smoking) with smokers, this population is an ideal group in which to further examine the relationship between negative affect and emotion regulation.

SUMMARY

Deficits in emotion regulation are associated with a wide variety of psychopathologies. Currently, research has predominately treated emotion regulation as a relatively stable construct, but there is movement toward a more dynamic conceptualization. Additionally, very little research has investigated the patterns of negative affect associated with emotion regulation abilities. This thesis project utilized ecological momentary assessment techniques and repeated lab visits in order to investigate the possible state-like qualities of emotion regulation and the relationship between emotion regulation abilities and negative affect over time.

CHAPTER 2: Introduction to the Current Study

RATIONALE FOR CURRENT STUDY

Emotion regulation has an extensive theoretical foundation. There are a variety of conceptualizations of emotion regulation and its closely related terms. Research on emotion regulation is growing, with a particular emphasis on how emotion regulation, often narrowed to a specific emotion regulation technique, is associated with a specific disorder, symptom, or behavior.

Despite an expanding body of literature, at this point, while some researchers have hypothesized certain affective patterns associated with high or low emotion regulation, there is very little research in this area, particularly outside of the laboratory setting. This EMA study was intended to provide some insight into the “movie” associated with emotion regulation, expanding beyond the “snapshot” that laboratory studies provide. Given the number of diagnoses and psychological problems that are significantly associated with emotion regulation difficulties, it is critical to develop a more thorough understanding of emotion regulation. Therefore, the current study provided an initial investigation of a more precise understanding of the real-time affective experiences of individuals with varying emotion regulation abilities.

SPECIFIC STUDY AIMS AND HYPOTHESES

Participants were assessed at three laboratory visits each one week apart as well as for a two week period in between laboratory visits using EMA techniques. The specific aims and corresponding hypotheses based on the literature are as follows:

Specific Aim 1

To examine the association between emotion regulation and negative affect as assessed in the laboratory.

Hypothesis 1.1

Difficulties in Emotion Regulation Scale (DERS) ratings will differ across subjects and across the three lab visits. No specific patterns for variability within subjects over time are predicted, as this investigation is exploratory to examine the possible state-like aspects of emotion regulation.

Hypothesis 1.2

Participants with higher DERS ratings will report higher negative affect ratings in the laboratory.

Hypothesis 1.3

On occasions when a participant reports a higher than average DERS rating, he/she will report higher negative affect ratings in the laboratory. Likewise, when a participant reports a lower than average DERS rating, he/she will report lower negative affect ratings at that laboratory visit.

Specific Aim 2

To examine the association between emotion regulation and negative affect as assessed in the field using EMA techniques.

Hypothesis 2.1

Participants with higher DERS ratings at the baseline laboratory visit will report higher negative affect ratings in the field.

Hypothesis 2.2

Participants with higher DERS ratings at the baseline laboratory visit will report more labile (measured by magnitude of change over time) negative affect ratings in the field.

Hypothesis 2.3

Participants with higher DERS ratings at the baseline laboratory visit will report more spikes of negative affect ratings in the field.

CHAPTER 3: Methods

The current study was a secondary analysis, using data collected for a larger study examining mindfulness meditation training as a means of reducing smoking. All data was collected at the Uniformed Services University of the Health Sciences (USUHS) in Bethesda, Maryland. The USUHS Institutional Review Board approved all study procedures.

RECRUITMENT PROCEDURES

Participants were adult, community-based smokers in the greater Washington, D.C. metropolitan area recruited using advertisements seeking smokers interested in meditation. Advertisements were displayed on local mass transit, the Express Paper, Craigslist.com, and the use of flyers throughout the community.

INCLUSION AND EXCLUSION CRITERIA

Participants were first screened via telephone to determine if they met eligibility criteria for the study. Participants were determined to be eligible if they were a current smoker, aged 18 to 65, who had been smoking at least 10 cigarettes a day for the past two years. Exclusion criteria included current participation in smoking cessation treatment, such as counseling or medication, or the current use of tobacco products other than cigarettes, such as cigars, pipes, and smokeless tobacco. Subjects were also excluded if their expired breath carbon monoxide (CO) was lower than 10 parts per million, as this would indicate less than regular cigarette use. Finally, participants could be excluded for any other factor that, in the judgment of the investigators, would likely preclude

completion of the protocol. Participants determined to be eligible during the phone screen were invited to attend the initial orientation session.

STUDY PROCEDURES

The following description of the study procedures is an abbreviated description of the procedures from the original study. Only procedures relevant to the current study will be described in depth. Table 1 presents the original study procedures. For a detailed description of the full procedures please see Ruscio (2013).

First Laboratory Visit

Once participants were determined to meet inclusion criteria via the phone screening, they were invited to attend the initial laboratory visit. To begin this session, study personnel gave a detailed overview of the study procedures and answered any questions prior to obtaining written informed consent. If individuals were ineligible or declined to participate, they were offered self-help materials and references to local smoking cessation programs. If individuals agreed to participate, they were randomly assigned to either the Brief Mindfulness or Control training condition. As the intervention is not the focus of the current study, randomization procedures and details on the conditions will not be described here. Participants were told that they could smoke “as much or as little as they like” during the study.

Participants then completed a number of self-report measures, including a demographic questionnaire, the Positive and Negative Affect Schedule (42), and the Difficulties in Emotion Regulation Scale (15). Finally, laboratory personnel introduced participants to the PDA used to collect EMA data. Personnel instructed participants on

how to complete the EMA assessments and ensured that participants were able to complete the assessments with no problems.

EMA Procedures

Upon leaving the first laboratory session, participants began carrying the PDA with them throughout their daily lives. The PDAs were programmed to alert participants to complete an assessment at four random times throughout the day. Participants were also instructed to practice meditating once a day at a time of their choosing. Participants were asked to complete one assessment following their Brief Mindfulness (or control) training as soon as possible after completion of training. Participants completed the Positive and Negative Affect Schedule – Short Form at each EMA assessment.

All EMA PDAs were HP iPAQs running the Microsoft Windows Pocket PC operating system. Programming for the assessments was done in C#.NET by Terminal C, a company based in Houston, Texas. Participants used a stylus or their finger to complete assessments using the PDA's touchscreen. There was no keyboard and very few external buttons. Assessments were designed to be taken just as a paper-and-pencil assessment would be, and participants simply had to tap the correct answer for a given question. No computer or typing skills were required to use the PDAs. All PDA functions other than the study assessments were locked such that the PDAs could essentially only be used for completing the assessments. The PDAs were quite small, making it easy for participants to carry throughout the day. Participants were also offered a carrying case for the PDA to protect it and make it easier for participants to carry.

Second Laboratory Visit

After one week with the PDA, participants returned to the laboratory for a second visit. Participants once again completed the PANAS and the DERS.

Third Laboratory Visit

After one additional week, participants returned to the laboratory for the third and final visit. Participants completed the PANAS and the DERS one more time.

MEASURES

Laboratory Measures

Positive and Negative Affect

The Positive and Negative Affect Schedule (42) was used to measure participants' affect over the past week. The PANAS consists of 20 items, ten negative affect items (PANAS-NA) and ten positive affect items (PANAS-PA). Examples of positive affect items include "excited" and "alert" while negative affect items include "upset" and "hostile." At the laboratory visits, participants were asked to rate how much they felt each affect item "in the past week". Items were rated on a five-point Likert scale ranging from 1 ("very slightly or not at all") to 5 ("extremely"). Total scores could range from 10 to 50, with a higher score indicating more experienced affect. Both subscales demonstrated good internal reliability, with Cronbach's α ranging from .86 -.90 for the positive affect subscale and .84 -.87 for the negative affect subscale (42).

Emotion Regulation

The Difficulties in Emotion Regulation Scale (DERS; 15) was used to measure participants' emotion regulation abilities. The DERS is a 36-item self-report questionnaire on which participants use a five-point Likert scale ranging from 1 ("almost never") to 5 ("almost always") to indicate the extent to which they experience each item.

Example items include “When I’m upset, I become out of control” and “I have no idea how I am feeling.” Total scores ranged from 36 to 180, with higher scores indicating more difficulties regulating emotion. Internal consistency is excellent (Cronbach’s $\alpha = .93$). The DERS does include six subscales, though these were not analyzed for the current study. These scales were not included because the hypotheses focused on overall emotion regulation ability rather than specific aspects of emotion regulation.

Additionally, the total DERS score had the highest internal reliability. Cronbach’s alpha for the total DERS score was .93 at lab visit 1, .93 at lab visit 2, and .90 and lab visit 3.

Participants were randomly assigned to either a Brief Mindfulness or Control training condition (described in Ruscio, 2013). There were no significant effects of the treatment group on the total DERS score.

EMA Measures

Positive and Negative Affect

The short form of the Positive and Negative Affect Schedule (PANAS-S) was used to measure affect in the field. The PANAS-S is comparable to the PANAS, but uses a subset of 10 items, five positive and five negative, from the 20 items on the original PANAS. Additionally, participants are asked how much they are feeling each affect item “at this moment” rather than “in the past week.” Cronbach’s alpha for EMA data was .92 for PANAS-PA and .90 for PANAS-NA.

ANALYTIC PLAN

Sample Characteristics

Demographic Information

Descriptive statistics (means, standard deviations, and/or percentages) were calculated for demographic variables such as age, gender, race, and education.

Field Assessment Information

Descriptive statistics (means and standard deviations) were calculated for EMA variables such as number of assessments completed, time between assessments, and number of max assessments.

General Analytic Strategy

Linear mixed models (LMM) using SAS PROC GLIMMIX (dichotomous outcomes) and PROC MIXED (continuous outcomes) were used for the primary data analyses of both laboratory (108 visits) and EMA data (1874 assessments). LMM takes into account the dependence between participant observations and allows for different numbers of observations across participants. For all models (laboratory and EMA data) we used a random (subject-specific) intercept and an autoregressive model of order 1 for the residuals within subjects (continuous outcomes). Treatment condition (BMM vs. Control) was also included as a covariate, because treatment condition had a significant effect on PANAS-NA assessed using EMA (31).

For analyses of laboratory data, the primary independent variables were a mean DERS score and a deviation DERS score. The mean DERS score was computed by aggregating over all available visits for each subject (i.e., a subject-level variable). The deviation DERS score (a visit-level variable) was computed as the difference between the DERS score at each visit and the Mean DERS score. The mean DERS score and the deviation DERS score were entered together in analyses. As described below, a significant effect for mean DERS score would indicate a between-subject association, and

a significant effect for the deviation PSS score would indicate a within-subject association (19). For analysis of laboratory data, visit number (1-3) was also included in all models as a covariate.

For the analyses of EMA data, DERS group (low vs. high) was the primary independent variable (described in more detail below). Consistent with Ruscio (2013), day was entered as a continuous variable in all models, and slopes were allowed to vary. Assessment type (3 levels: “valid” meditation assessment (MA), “invalid” MA, and random assessment) was included as a covariate. As described in Ruscio (2013), valid MAs were participant-initiated assessments that were completed within 60 seconds of the completion of Brief-MM or Control trainings. Invalid MAs were participant-initiated assessments that were initiated more than 60 seconds following Brief-MM or Control trainings. For analysis of discrete episodes, e.g., maximum level of negative affect, we used ANOVA, with DERS group (low vs. high) as the primary independent variable. Participants were divided into high and low DERS groups using a median split on the baseline DERS score. Low DERS participants (n=18) had a DERS score of 70 or below at the baseline visit (mean DERS = 59.22, SD = 7.18), and high DERS participants (n=19) had a score of 71 or greater (mean DERS = 96.21, SD = 17.77). For select analyses, the DERS score at baseline was examined as a continuous variable.

Alpha was set to .05, and all tests were 2-tailed.

Primary Analyses

Specific Aim 1.1

To examine whether DERS ratings differed across subjects and across laboratory visits, the interclass correlation coefficient (ICC) was calculated for the DERS scores across the three laboratory visits.

Specific Aim 1.2

A LMM was used to evaluate whether DERS ratings in the laboratory visit were associated with negative affect ratings in the laboratory. The independent variable was the participant's mean DERS score and the dependent variable was the participant's PANAS-NA scores at each laboratory visit. A significant parameter estimate (PE) for Mean DERS score would indicate a between-subject association. That is, participants who report generally higher DERS scores report generally higher levels of negative affect at the laboratory.

Specific Aim 1.3

In order to evaluate the within-subject relationship between laboratory DERS and negative affect, subjects' Deviation DERS scores were calculated for each visit as described earlier. The deviation scores at each visit were the independent variables and the PANAS-NA scores at each visit was the dependent variable. A significant parameter estimate for Deviation DERS score would indicate a within-subject association. That is, when participants who report a higher DERS score than their average, they report higher levels of negative affect.

Specific Aim 2.1

First, a LMM was conducted to evaluate the overall difference in negative affect between the high and low DERS groups during EMA. One-way ANOVAs were then

conducted to test for significant differences between high and low DERS groups at pre-max, max, and post-max negative affect assessments (described later). For each analysis, the DERS group (low vs. high) was the independent variable and the PANAS-NA data was the dependent variable.

Specific Aim 2.2

The relationship between DERS scores at baseline and negative affect liability in the field was examined in several ways. First, LMMs were conducted to determine if the two DERS groups differed in assessment-to-assessment change in PANAS-NA scores. Second, one-way ANOVAs were conducted to evaluate the difference between groups on the magnitude of “jumps” to the maximum level of PANAS-NA in the EMA data.

Specific Aim 2.3

Due to the low number of spikes in negative affect and the non-normality of the distributions, a non-parametric test was used to determine whether the two DERS groups differed on number of negative affect spikes.

Power Analyses

All power analyses assume $\alpha = .05$ and a 2-tailed test, and were conducted using G Power version 3.1.3 using the methods of Ruscio (2013). For Specific Aims 1.2 and 1.3, given that data were available from 108 visits from 44 participants, and given an $ICC = .73$, we had power = .80 to detect a medium-to-large effect size of $\rho = .38$. For Specific Aim 2.1, for the ANOVA model, with $n=37$ we had power = .80 to detect a large effect size of Cohen's $d = 0.95$. For the analysis of EMA data, power was greater, due to the larger number of assessments. With an $ICC = .5$, and given that the mean number of assessments completed by each participant was about 50, we had power = .80 to detect a

medium-to-large effect size of Cohen's $d = 0.67$. For Specific Aim 2.2, for the ANOVA model examining between-group differences in "jumps", with $n=37$ we had power = .80 to detect a large effect size of Cohen's $d = 0.95$. For Specific Aim 2.3, with a non-parametric test with $n=37$ we had power = .80 to detect a large effect size of Cohen's $d = 0.98$. Overall, given the relatively small sample sizes, the study had good power to detect medium-to-large or large effect sizes for the primary analyses, and power was greater for analysis of EMA due to the larger number of observations.

CHAPTER 4: Results

SAMPLE CHARACTERISTICS

Demographic Information

Table 2 shows the CONSORT chart from the parent study detailing the flow of participants. Overall, 44 participants were randomized to treatment condition (BMM vs. Control) and completed DERS and PANAS assessments during at least one laboratory visit. The primary analyses on lab data focus on data from 108 laboratory visits completed by the 44 participants. Of those 44 participants, 37 participants completed at least one EMA assessment during the course of the study. The primary analyses on EMA data focus on data from the 37 participants who completed a total of 1874 EMA assessments. Of these 37 participants, 34 participants provided data from at least one of visits 2 and 3, and 32 participants completed all study visits.

Demographic information for the EMA sample ($n = 37$) can be seen in Table 3. The mean age of the sample was about 45 years. Fifty-four percent of the sample was female. About 65% of the sample identified as Caucasian, 32% identified as Black or African American, and 3% identified as other. On average, participants had completed 14 years of education and smoked about 16 cigarettes per day.

Participants were divided into high and low DERS groups using a median split on the baseline DERS score (Table 4). The two DERS groups did not differ significantly on age, sex, race, cigarettes smoked per day, or years of education (Table 4). Nine (50.00%) of the low DERS participants and 11 (57.89%) of the high DERS participants were assigned to the BMM group, $\chi^2(1) = 0.23$, $p = .63$.

Field Assessment Information

Characteristics of the 37 participants' field assessments were examined. Figure 1 illustrates a comparison graph showing a subject from the high DERS group and a subject from the low DERS group to illustrate differing affective patterns. Assessment data combined and separated by group are presented in Tables 5 and 6. An emphasis was placed on the assessments at which participants reported their highest level of negative affect ("Max" assessments), as well as the assessments immediately preceding ("Pre" assessment) or following ("Post" assessment) the Max assessments as these time points were the focus of many of the analyses. Participants completed an average of 51 total EMA assessments and reported their highest negative affect twice on average. Maximum negative affect ratings occurred on average in the early afternoon around the seventh day of the study. There was on average about eight hours in duration between the Max and Pre assessments, and about nine hours between the Max and Post assessments. There was no significant difference between groups on any of these characteristics (Table 6).

PRIMARY ANALYSES

Specific Aim 1.1

The interclass correlation coefficient (ICC) for the DERS scores across all three laboratory visits was .73 ($p < 0.001$) indicating significant variability in subject scores. An ICC above .5 but below 1 suggests that while the majority of the variability in the data is due to differences between subjects, some variability is due to within-subject differences over time (visits).

Specific Aim 1.2

A LMM was conducted to investigate the relationship between the participant's Mean DERS score and PANAS-NA at each visit. The LMM revealed a significant effect

of Mean DERS ($PE = 0.17$, $SE = 0.05$, $F(1, 61) = 10.90$, $p = .001$). This is illustrated in Figure 2, which displays a scatterplot to show the relationship between mean DERS score and mean negative affect across the laboratory visits ($r = .46$, $p = .002$). This scatterplot illustrates that higher Mean DERS scores are associated with higher negative affect in the laboratory.

Specific Aim 1.3

LMM was used to examine the relationship between deviation DERS scores and negative affect at each laboratory visit. Analyses revealed a significant finding ($PE = 0.15$, $SE = 0.05$, $F(1, 61) = 9.31$, $p = .003$) indicating a significant relationship between deviation DERS scores and PANAS-NA. Figure 3 displays a scatterplot of the data illustrating these findings that suggest that a higher deviation DERS score (positive deviation score) is associated with higher negative affect at that visit. That is, when a participant reports a higher DERS score than his or her average, he or she also reports greater negative affect.

Specific Aim 2.1

Several analyses were run to investigate the relationship between baseline DERS status and PANAS-NA assessed in the field. First, a LMM using all EMA assessments (1874 assessments) showed a significant effect of Group ($PE = 1.90$, $SE = 0.82$, $F(1, 1798) = 5.42$, $p = .02$), indicating that individuals in the high DERS group had higher overall negative affect across all of the EMA assessments than low DERS individuals.

Next, ANOVAs were conducted to examine between group differences at Max assessment points, as well as at Pre and Post assessments. Figure 4 illustrates the PANAS-NA for both groups across these three time points. Significant group differences

were not found at the Pre assessment ($F(1, 33) = 0.20, p = .66$) or at the Post assessment ($F(1, 34) = 0.51, p = .48$). However, there was a significant effect of Group at the Max time point with the high DERS group reporting significantly higher negative affect ($F(1, 35) = 5.07, p = .03$). Figure 5 shows a breakdown of participants' max negative affect scores for the two groups.

Specific Aim 2.2

The association between DERS and lability was assessed in a number of analyses. Figure 6 illustrates the proportion of spikes (increase in negative affect from prior assessment), drops (decrease in negative affect from prior assessment), and no change (same level of negative affect from prior assessment) across all assessments for the two groups. This chart shows that individuals in the high DERS group appeared to experience more change (jumps and drops) across assessments compared to the low DERS group. To test this, each assessment (except the first in a participant's series) was coded as "changed" if the PANAS-NA score at time t_1 was different (lower or higher) than the PANAS-NA score at the previous assessment (t_0) or "no change" if PANAS-NA at t_1 was the same as at t_0 . A LMM revealed that there was an effect of Group on this dichotomous change/no change outcome ($PE = 0.82, SE = 0.42, F(1, 1797) = 3.90, p = .04; OR = 2.28, 95\% CI = 1.01, 5.17$). For any given assessment, being in the high DERS group more than doubled the odds of a change in PANAS-NA from the previous assessment.

Next, a LMM was used to determine if the absolute magnitude of change differed between groups across all EMA assessments. The dependent variable was the modulus of

the change score. Again, there was a significant main effect of Group ($PE = 1.16$, $SE = 0.43$, $F(1, 1761) = 7.15$, $p = .008$). These data are illustrated in Figure 7.

Finally, an ANOVA was used to investigate the difference between groups on the “jumps” from Pre assessments to Max assessments and on “drops” from Max to Post assessments. There was a significant effect of Group when examining jumps from Pre to Max assessments ($F(1, 33) = 14.90$, $p = .0005$), again suggesting that high DERS participants experience greater changes in negative affect. Figure 8 illustrates the relationship between baseline DERS scores assessed as a continuous variable and jumps in negative affect. As baseline DERS score increased, jumps in negative affect increased ($F(1, 33) = 11.70$, $p = .002$).

The effect of Group was not significant for the Max to Post “drops” whether the baseline DERS was coded as a dichotomous ($F(1, 34) = 3.74$, $p = .06$) or continuous variable ($F(1, 34) = 3.32$, $p = .07$).

Specific Aim 2.3

A non-parametric test was used to test for differences in the number of spikes of negative affect. A spike was defined as a PANAS-NA score of 20 or more. Low DERS participants ($n=18$) experienced an average of 1.88 spikes ($SD = 7.52$, Range 0-32) and high DERS participants ($n=19$) experienced an average of 1.26 spikes ($SD = 2.23$, Range 0-7). A Wilcoxon between-group test revealed that there was no effect of Group on number of spikes (Wilcoxon $S = 306.0$, $z = -1.38$, $p = .17$). This may be in part due to the very low number of participants who showed any spikes. While the majority had no spikes, 36.84% of the high DERS participants had a spike over 20, while only 16.67% of the low DERS participants experienced a spike ($p = .17$). In addition, one low DERS

participant reported 32 spikes (> 5 SD over the overall mean). If this outlier were removed, a Wilcoxon between-group test revealed that there was non-significant trend toward an effect of Group on number of spikes (Wilcoxon $S = 269.0$, $z = -1.83$, $p = .06$). Figure 9 shows the breakdown of the number of spikes for all participants, with the outlier removed.

Chapter 5: Discussion

The primary goal of this study was to investigate the relationship between emotion regulation ability and negative affect. Laboratory data were used to investigate the state and trait-like aspects of emotion regulation, while data collected in the field provided insight into the real-time, real-world affective patterns associated with varying levels of emotion regulation abilities. Overall, the findings suggest the presence of state- and trait-like aspects of emotion regulation and that emotion regulation abilities are related to the intensity and lability of negative affect.

ASSOCIATION BETWEEN EMOTION REGULATION AND AFFECT IN THE LABORATORY

The administration of the DERS at all three laboratory visits allowed for an investigation of the relationship between emotion regulation and negative affect both over time and each discrete time point. These analyses begin to provide some insight into the possibility of state and trait aspects of emotion regulation. The calculated ICC of .73 for the DERS scores across visits indicates that the majority of variability is due to differences between subjects, or trait differences between emotion regulation abilities. Indeed, mean DERS score across visits were significantly associated with mean negative affect across visits, and individuals with poor overall emotion regulation abilities had higher intensity of negative affect. These findings support the majority of emotion regulation conceptualizations that view emotion regulation as a trait measure. In addition, the direction of the relationship supports the hypothesis that dysregulated individuals have more intense negative affect (25).

Though the ICC of .73 implies that the majority of variability is due to between-subject differences, it still leaves 27% of variability that is accounted for by within-subject differences over time. This suggests that while emotion regulation may be predominately trait-like, the state-like aspects should not be overlooked. The significant relationship between the Deviation DERS score and negative affect at each visit indicates that visit-to-visit changes in emotion regulation abilities are themselves related to negative affect. Therefore these changes in DERS ratings appear to be meaningful, rather than, for example, just reflecting measurement error. The results support the notion that better or worse emotion regulation over a certain time period has a significant relationship with the negative affect an individual experiences during that time period.

ASSOCIATION BETWEEN EMOTION REGULATION AND AFFECT IN THE FIELD

The results from the field begin to illustrate the “movie” of negative affect for individuals with high and low emotion regulation abilities. Figure 1 illustrates the sometimes dramatic difference in negative affect patterns between individuals in the high and low DERS groups. As with the laboratory data, the findings from the field support the prediction that individuals with poor emotion regulation abilities will have more intense negative affect (25). Participants in the high DERS group had higher overall levels of negative affect as well as higher maximum affect. Additionally, the high DERS participants showed more changes in their negative affect, had an overall greater average magnitude of change in negative affect, and had larger jumps to their maximum negative affect all supporting the idea that these individuals have more labile negative affect than the low DERS participants.

Contrary to Linehan's prediction, high DERS participants did not show a slower return to baseline when following an increase in negative affect. It is possible that this hypothesis would hold true for individuals in a clinical sample while the current sample was comprised primarily of individuals without a current or past major psychological diagnosis. Clarifying the possible differences in the negative affect patterns between a clinical and a healthy sample, as well as examining differences between diagnoses could be an important area for future research.

This study begins to provide some insights into the affective patterns associated with high and low emotion regulation. Knowing how negative affect may rise and fall for various groups in the real-world is just as important, if not more important, than investigating responses in the laboratory as this data is likely more representative of day-to-day experiences (35). EMA techniques provide valuable data about the real-world experiences of individuals that can provide meaningful information for truly understanding the concept of emotion regulation above and beyond theory and responses studied in a laboratory setting.

STRENGTHS

The primary strength of this study is the use of repeated laboratory visits and EMA techniques provided unique ways to investigate the relationship between emotion regulation and affect. The benefits of EMA technology deserve particular emphasis. The use of EMA minimizes recall bias and maximizes ecological validity. These techniques allow for a detailed perspective on experiences such as affect that are constantly changing throughout daily life. Additionally, the length of the study provides a tremendous amount of data both overall and for each individual participant.

LIMITATIONS

There were several limitations to this current study. Notably, this was a secondary data analysis and the original study included an intervention. Twenty of the participants included in this study received a brief mindfulness intervention on the PDA while completing the EMA data collection. The other 17 participants were in the control condition. Intervention condition was controlled for in all analyses, and there were no significant effects of treatment condition on the DERS scores, but it is possible that the presence of the intervention limits the generalizability of the current findings. That is, it is not certain that the current findings would be obtained in non-smokers or in more naturalistic circumstances when individuals are not receiving brief mindfulness or control trainings.

Additionally, the data presented here are correlational. It is not possible to state that emotion regulation causes the patterns of negative affect observed in the field data or the differences between groups observed in the laboratory. It is possible that one or more confounding variables influenced the observed results. For example, the current study had no objective measure of external stress. It is possible that individuals in the high DERS group showed increased negative affect intensity and lability due to more stress in their lives.

IMPLICATIONS AND FUTURE DIRECTIONS

A number of implications and directions for future research arise from the current study. First, additional analyses can be conducted with existing data from the original study. Though most emotion regulation research focuses on negative affect, an

examination of positive affect using analyses similar to those conducted above could provide additional insight into the other half of the affective experience. Additionally, the original study was an examination of a smoking intervention. Current data already includes both craving and smoking data. Examining the relationship between emotion regulation ability, affect, craving, and smoking behavior may provide very useful information for tailoring smoking cessation interventions.

Looking beyond the current study, the reported findings support the existence of more state-like aspects of emotion regulation than previous conceptualizations have included. The current results indicate that an individual's emotion regulation capabilities in any given moment may differ quite significantly from their average ability and may strongly influence their experience and actions. Future studies should include a state measure of emotion regulation such as the S-DERS (14), a new, shorter emotion regulation measure designed to assess emotion regulation abilities in the moment. Additional measures, such as psychophysiological measures could also be included to gain a less subjective measure of experience and arousal. Studies using such measures, combined with tightly spaced EMA assessments could provide a very detailed, insightful look at the real-time affective experiences associated with differing levels of both state and trait emotion regulation.

A better understanding of state emotion regulation and its influence on thoughts, behaviors, and emotions could be very beneficial for the general understanding of emotion regulation and emotion regulation focused therapies such as DBT. In the future, a more thorough understanding of the interplay between trait and state emotion regulation

and behaviors associated with dysregulation (e.g. drug use or self-harm) could contribute to more tailored, in the moment interventions delivered via handheld electronics.

Table 1. Summary of Original Study Procedures

	Phone Scr.	Visit 1 (Day 0)	Day +0 to Day +7	Visit 2 (Day +7)	Day +8 to Day +14	Visit 3 (Day +14)
Modality/Location of Contact	Phone	USU		USU		USU
Inclusion/Exclusion Criteria	X	X				
QUESTIONNAIRE ASSESSMENTS						
Demographics		X				
Smoking History		X				
Saliva Questionnaire		X				
ORS		X				
MAAS		X		X		X
PANAS		X		X		X
EQ		X		X		X
DERS		X		X		X
WISDM		X		X		X
TMS		X		X		X
Smoking Assessments (Diary)		X	X	X	X	X
BIOCHEMICAL ASSESSMENT						
Breath Sample for CO		X		X		X
Saliva Sample for Cotinine		X		X		X
INFORMED CONSENT						
		X				
RANDOMIZATION						
		X				
MINDFULNESS PSYCHOED. PDA TRAINING						
Participant receives training		X				
LAB ASSESSMENTS						
Depression IAT		X		X		X
Standard VP		X		X		X
PDA ASSESSMENTS						
4 RAs and one MA per day (D-IAT/VP, PA, NA, TMS, craving)		X	X	X	X	X
COMPENSATION*						
Laboratory Sessions		\$50		\$15		\$15
Each PDA assessment		\$1	\$1	\$1	\$1	\$1
Home Meditation Practice			\$5		\$5	
ESTIMATED DURATION						
Minutes**	10	120 (lab) + 30 (RAs)	40 (RA) 10 (MA)	75 (lab) + 40 (RA)	40 (RA) 10 (MA)	75 (lab) +20 (RA)

Note. NA = negative affect; PA = positive affect; PANAS = Positive and Negative Affect Schedule; PDA = personal digital assistant; RA = random assessment; USU = Uniformed Services University. The following measures were used in the parent study, but not in the current study: CO = carbon monoxide; EQ = Experiences Questionnaire; IAT = Implicit Association Test; MA = meditation assessment; MAAS = Mindful Attention and Awareness Scale; TMS = Toronto Mindfulness Scale; VP = Visual Probe; WISDM = Wisconsin Inventory of Smoking Dependence Motives.

Table 2. CONSORT flow diagram from the original study.

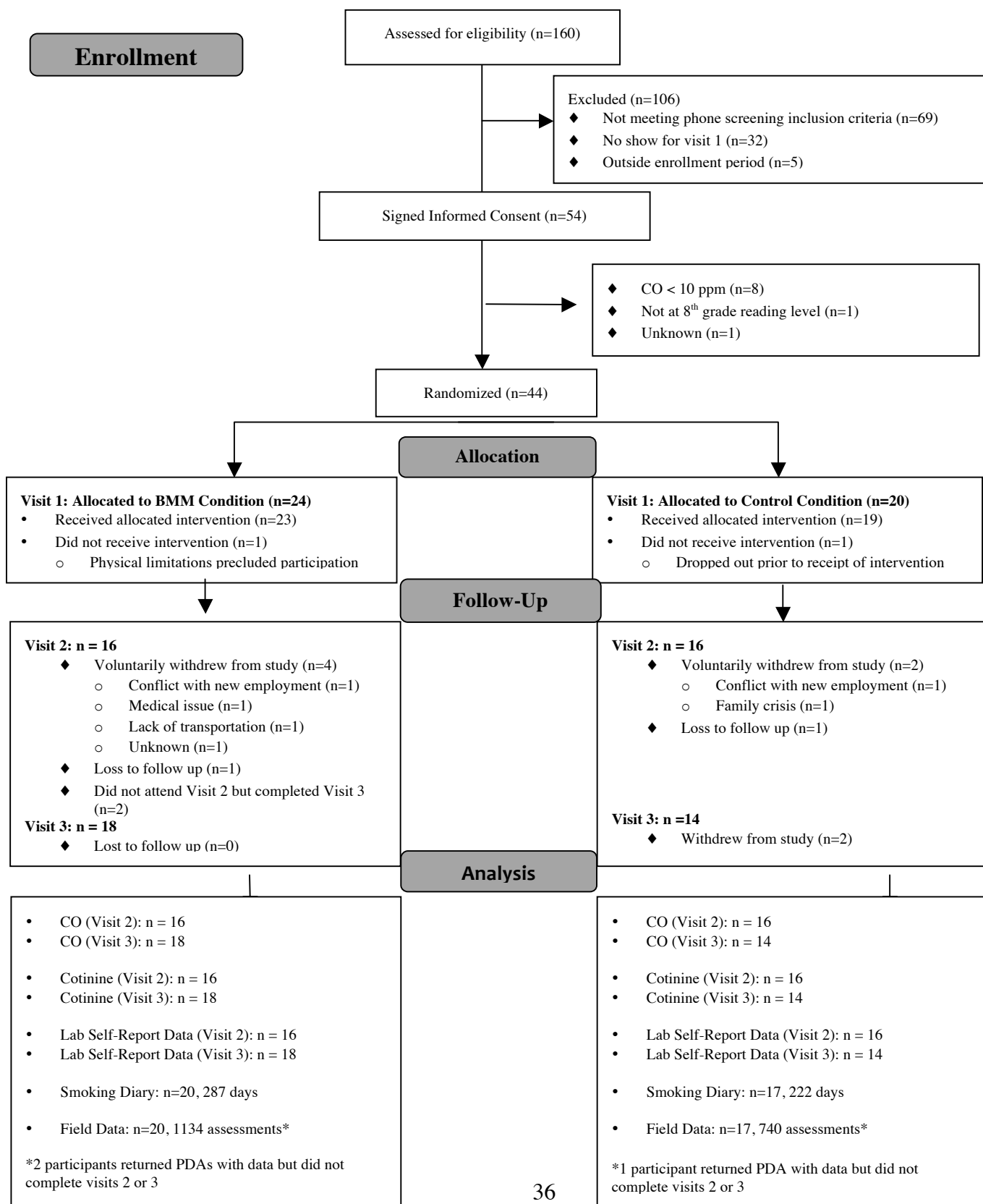


Table 3. Demographic information for participants who completed at least one EMA assessment (N = 37).

	M or %	SD
Age	44.84	11.41
Sex		
Male	45.9	
Female	54.1	
Race (%)		
White	64.9	
Black	32.4	
Other	2.7	
Cigarettes Per Day	16.46	7.65
Years of Education	13.95	2.60

Table 4. Demographic information for participants who completed at least one EMA assessment broken down by high (n = 18) and low (n = 19) DERS at baseline.

	Low DERS (n = 18)	High DERS (n =19)	t/χ^2	p
Age	47.98 (9.80)	41.87 (12.28)	2.71	.11
Sex (%)			0.23	.63
Male	50.0	42.1		
Female	50.0	57.9		
Race (%)			0.97	.62
White	66.7	63.2		
Black	33.3	31.6		
Other	0.0	5.3		
Cigarettes Per Day	15.61 (7.11)	16.56 (7.87)	-0.38	.71
Years of Education	14.50 (2.20)	13.50 (3.00)	1.15	.26

Table 5. Assessment statistics for participants who completed at least one EMA assessment (N = 37).

	M	SD
Number of Assessments	50.65	26.32
Number of Max Assessments	1.81	1.33
Day of Max Assessment	6.70	5.23
Time of Day for Max Assessment	14:57	4:52
Time Between Assessments (hr)		
Pre to Max	8.16	8.09
Max to Post	9.16	12.27

Table 6. Assessment information for participants who completed at least one EMA assessment broken down by high (n = 18) and low (n = 19) DERS at baseline.

	Low DERS (n = 18)	High DERS (n =19)	t	p
Number of Assessments	47.3 (20.2)	53.8 (31.3)	-0.76	.23
Number of Max Assessments	1.94 (1.31)	1.68 (1.38)	0.59	.56
Day of Max Assessment	6.06 (4.21)	7.32 (6.09)	-0.73	.47
Time of Day for Max Assessment	15:54 (4:28)	14:03 (5:11)	1.16	.25
Time Between Assessments (hr)				
Pre to Max	6.93 (5.29)	9.47 (10.28)	-0.91	.37
Max to Post	10.75 (15.07)	7.58 (8.80)	0.77	.45

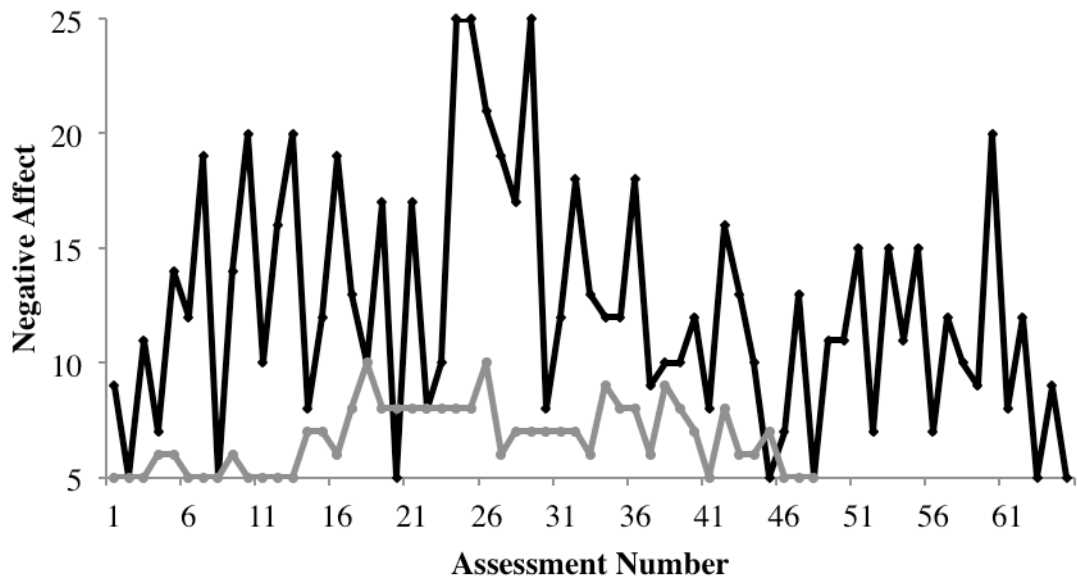


Figure 1. Comparison of negative affect for a high DERS subject (subject 21, black line) and a low DERS subject (subject 4, grey line) across EMA assessments.

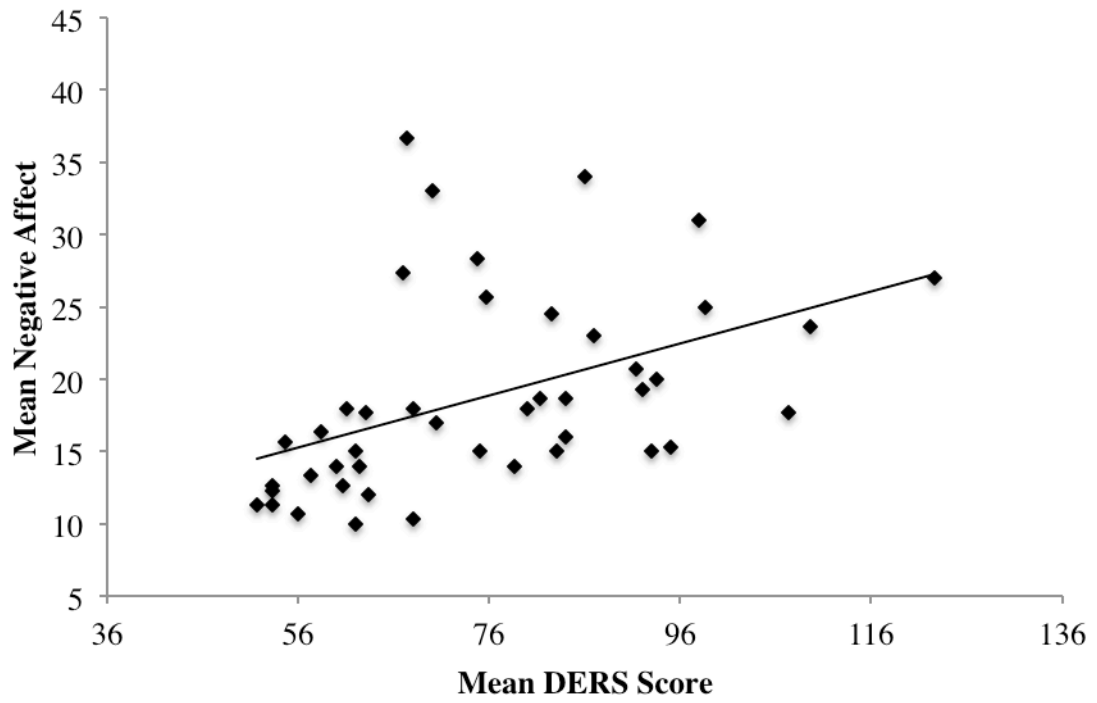


Figure 2. Scatterplot of mean negative affect and mean DERS scores in the laboratory. DERS scores can range from 36 to 180 with higher scores indicating more difficulties with emotion regulation.

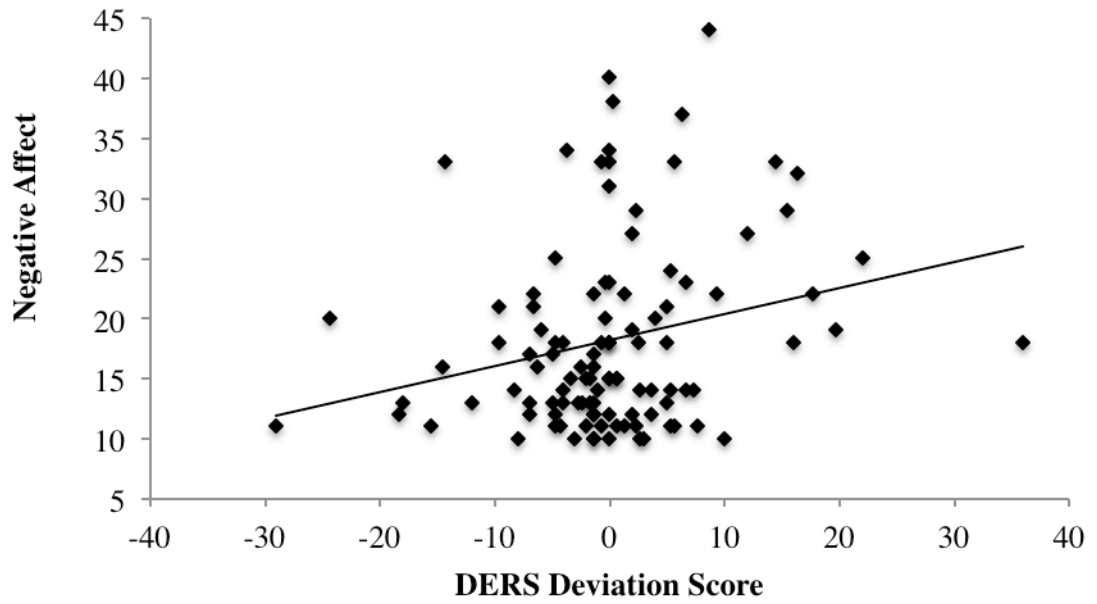


Figure 3. Scatterplot of negative affect and DERS deviation scores at each laboratory visit. Negative deviation scores indicate lower than mean DERS score (better emotion regulation) while positive scores indicate a higher than average score.

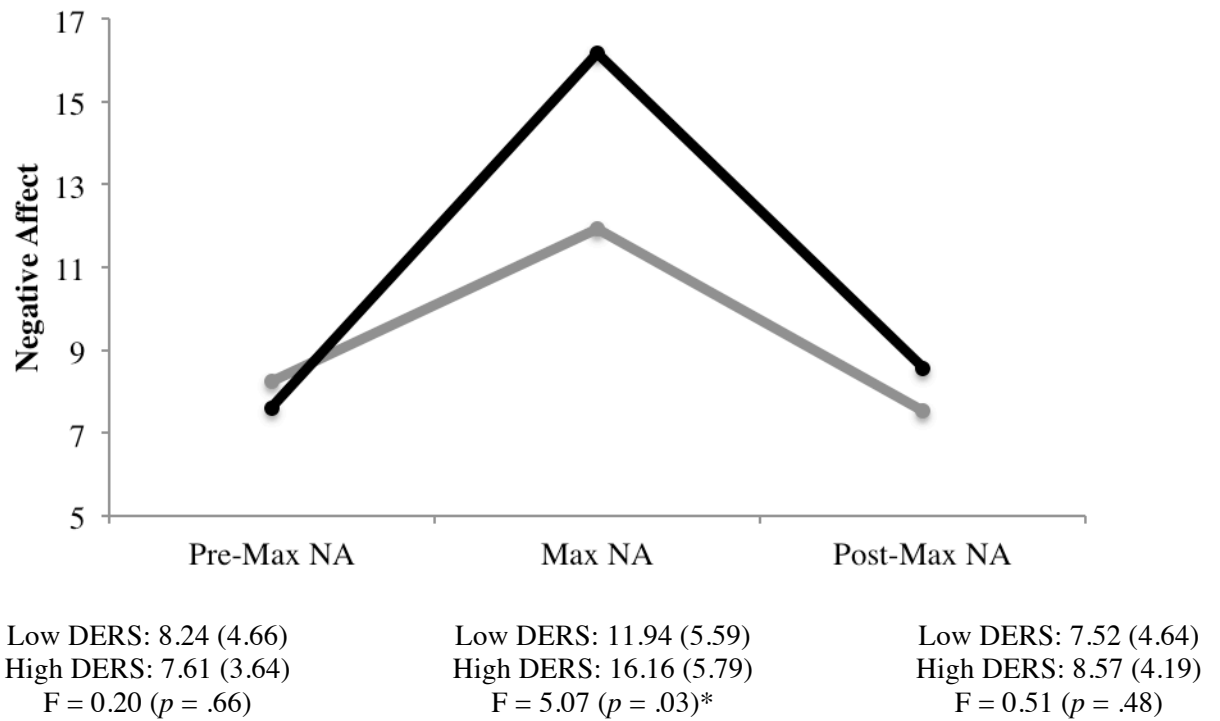


Figure 4. Mean negative affect at pre-max, max, and post-max time points by group. High DERS group is shown in black and low DERS group is shown in light grey.

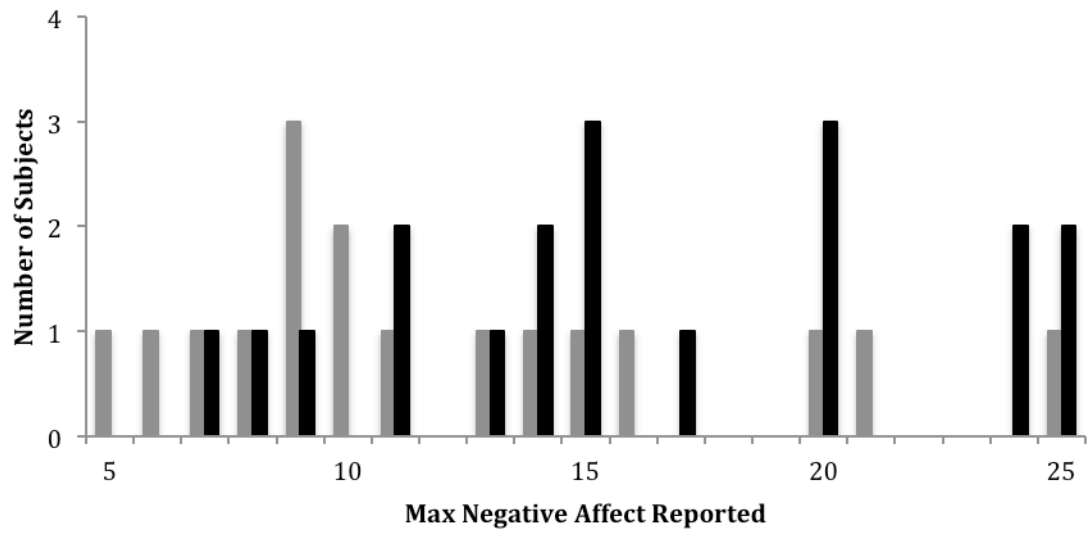


Figure 5. Breakdown of maximum negative affect score reported. High DERS group is shown in black and low DERS group is shown in light grey.

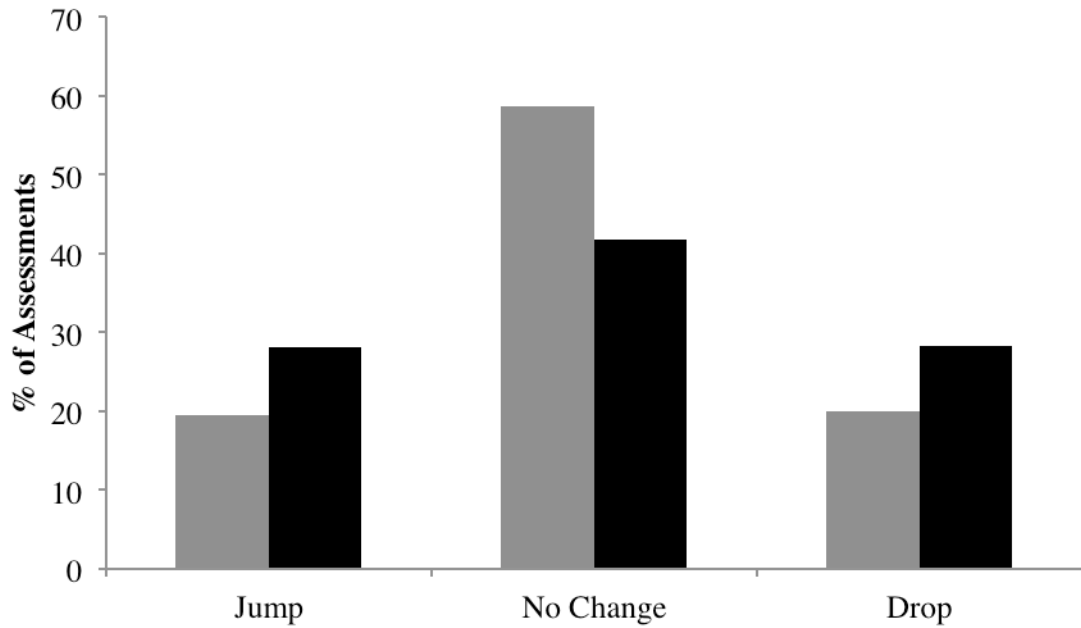


Figure 6. Breakdown of jumps, drops, and no change across all 1874 EMA assessments. High DERS group is shown in black and low DERS group is shown in light grey.

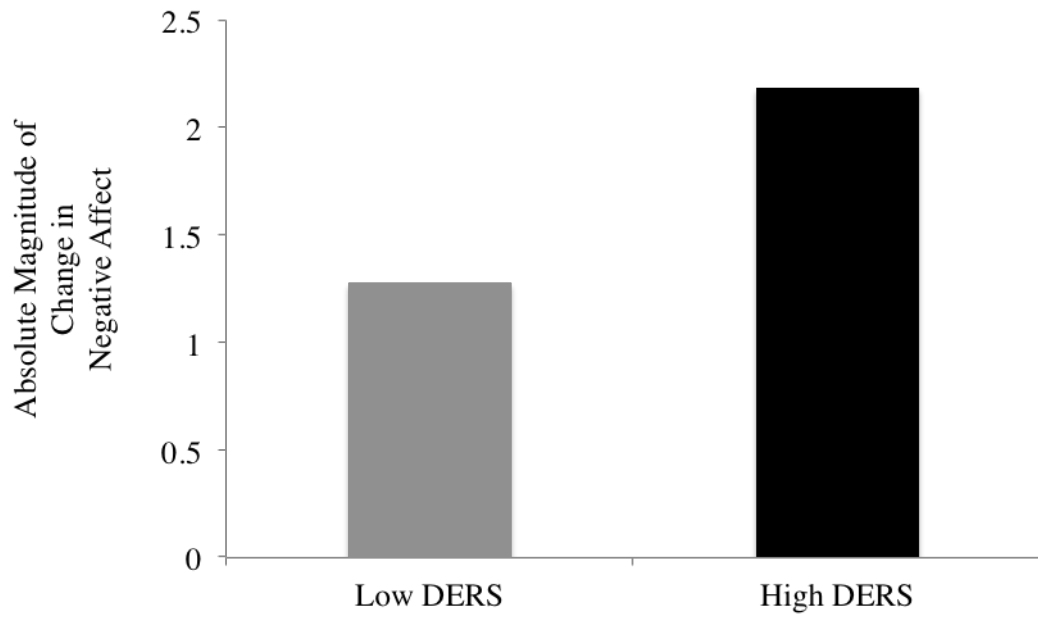


Figure 7. Average absolute magnitude of change across all EMA assessments for high and low DERS groups.

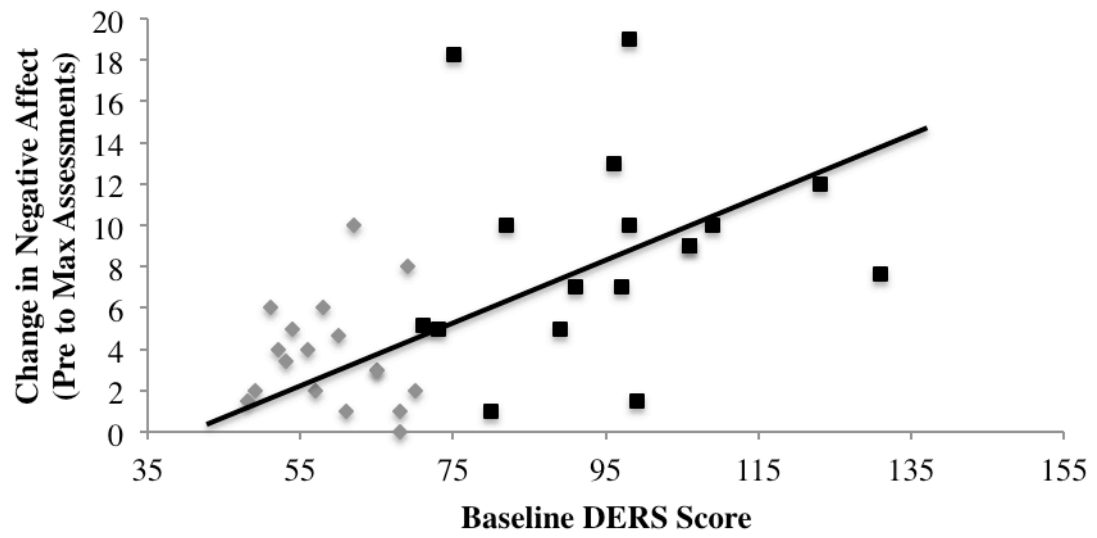


Figure 8. Scatterplot illustrating the relationship between baseline DERS score and average jump from pre-max to max assessments. High DERS group is shown in black and low DERS group is shown in light grey.

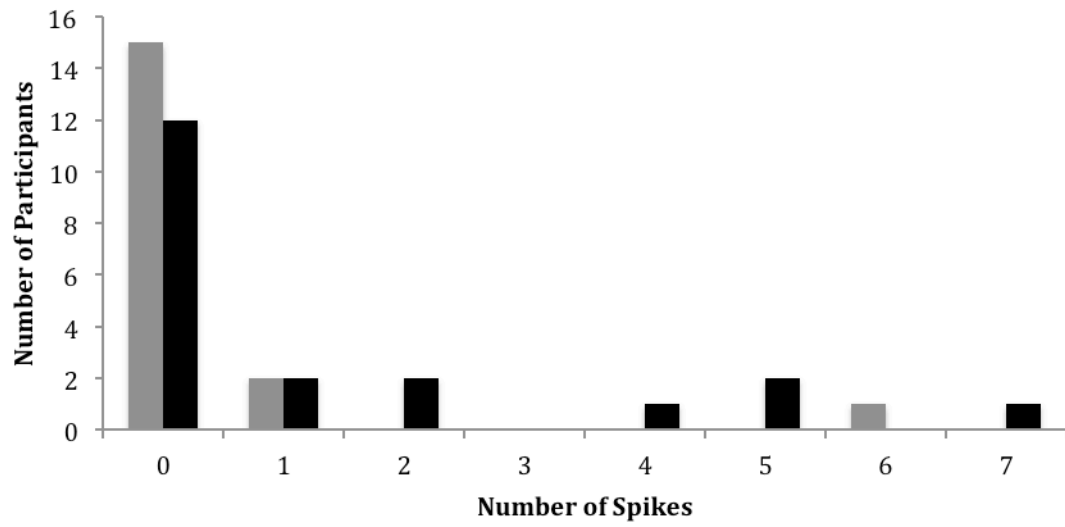


Figure 9. Number of instances where PANAS negative affect score was at least 20 for each participant. High DERS group is shown in black and low DERS group is shown in light grey.

Appendix A: Self-Report Measures

DEMOGRAPHICS QUESTIONNAIRE

- Q1. What is your date of birth? _____ / _____ / _____
mm / dd / yyyy
Refuse to Answer
- Q2. What is your gender? 1 Male
 2 Female
- Q3. What is your present marital status? (Choose one)
- 1 Single
 2 Married
 3 Divorced
 4 Widowed
 5 Living with significant other
 6 Separated
 8 Refuse to Answer
- Q4. How many years of education have you completed? (Choose one)
- 01 1 (Elementary School)
 02 2 (Elementary School)
 03 3 (Elementary School)
- 04 4 (Elementary School)
 05 5 (Elementary School)
 06 6 (Middle School)
 07 7 (Middle School)
 08 8 (Middle School)
 09 9 (High School)
 10 10 (High School)
 11 11 (High School)
 12 12 (High School)
 13 13 (Some College)
 14 14 (Vocational or Community College Degree)
 16 16 (Four Year College Degree)
 17 17 (Some Postgraduate Work)
 18 18 (Postgraduate Degree; Master Degree)
 20 20 (Postgraduate Degree; M.D., Ph.D., DDS, Dr.P.H., etc.)
 98 Refuse to Answer
- Q5. Are you of Hispanic/Latino origin? 1 Yes
 0 No
 8 Refuse to Answer

Q6. What category best describes your race? (Choose one)

- 1 Anglo American/Euro American/White
- 2 African American/Black
- 3 Asian American
- 4 Native of Hawaii or other Pacific Islander
- 5 Native American or Alaska Native
- 6 Mixed Race
- 7 Other
- 8 Refuse to Answer

If Q6 is equal to 8 or Q6 is less than 7, then skip to Q8.

Q7. Please specify your race_ _ _ _ _

Q8. Do you receive Medicare, Medicaid, or Medical Assistance currently?

- 1 Yes
- 0 No
- 7 Don't Know
- 8 Refuse to Answer

Q9. Do you have private insurance or group insurance?

- 1 Yes
- 0 No
- 7 Don't Know
- 8 Refuse to Answer

Q10. What is your total family income per year, before taxes? (Choose one)

- 01 Less than \$10,000 per year or less than about \$833 per month
- 02 \$10,000 to \$19,999 per year or less than about \$1250 per month
- 03 \$20,000 to \$29,999 per year or less than about \$2083 per month
- 04 \$30,000 to \$39,999 per year or less than about \$2916 per month
- 05 \$40,000 to \$49,999 per year or less than about \$3750 per month
- 06 \$50,000 to \$59,999 per year or less than about \$4583 per month
- 07 \$60,000 to \$69,999 per year or less than about \$5416 per month
- 08 \$70,000 to \$79,999 per year or less than about \$6250 per month
- 09 \$80,000 to \$89,999 per year or less than about \$7083 per month
- 10 \$90,000 to \$99,999 per year or less than about \$7916 per month
- 11 \$100,000 or more per year or more than \$8333 per month
- 98 Refuse to Answer

Q11. Generations in the U.S. Please choose the best response: (Choose one)

- 1 I'm an immigrant of the US
- 2 I was born in the US
- 3 One of my parents and I were born in the US (the other parent immigrated)
- 4 My parents and I were born in the US
- 5 My grandparents, my parents, and I were born in the US
- 6 My great-grandparents and ancestors were born in the US
- 8 Refuse to Answer

If Q11 is greater than 1, then skip to Q13.

Q12. What year did you immigrate to the US?

— — — —

Refuse to Answer

Q13. Employment Status. Please choose the best response: (Choose one)

- 01 Regular full-time (30 or more hours per week)
- 02 Regular part-time (less than 30 hours per week)
- 03 Unemployed, currently *looking* for work
- 04 Unemployed, currently *NOT looking* for work
- 05 Homemaker
- 06 Student
- 07 Retired
- 08 Unable to work or disabled
- 09 Other
- 98 Refuse to Answer

If Q13 is less than 9, then skip to Q15.

Q14. Please specify your employment status.

Q15. In the past 30 days, what was the primary source of your income? (Choose one)

- 1 A job
- 2 Unemployment Benefits
- 3 VA/Disability/Social Security Income
- 4 Welfare/Food Stamps/Aid to Family with Dependent Children
- 5 Alimony or Child Support
- 6 Spouse/partner is main source of income
- 8 Refuse to Answer

Q16. Have you ever engaged in a daily mindfulness practice?

Q17. Have you ever been exposed to mindfulness meditation through cultural affiliation,

religious affiliation, medical treatment, or any other method?

Please Specify and Describe:

POSITIVE AND NEGATIVE AFFECT SCHEDULE (PANAS)

PANAS Questionnaire

This scale consists of a number of words that describe different feelings and emotions. Read each item and then list the number from the scale below next to each word. **Indicate to what extent you feel this way right now, that is, at the present moment OR indicate the extent you have felt this way over the past week (circle the instructions you followed when taking this measure)**

1	2	3	4	5
Very Slightly or Not at All	A Little	Moderately	Quite a Bit	Extremely

_____ 1. Interested	_____ 11. Irritable
_____ 2. Distressed	_____ 12. Alert
_____ 3. Excited	_____ 13. Ashamed
_____ 4. Upset	_____ 14. Inspired
_____ 5. Strong	_____ 15. Nervous
_____ 6. Guilty	_____ 16. Determined
_____ 7. Scared	_____ 17. Attentive
_____ 8. Hostile	_____ 18. Jittery
_____ 9. Enthusiastic	_____ 19. Active
_____ 10. Proud	_____ 20. Afraid

Scoring Instructions:

Positive Affect Score: Add the scores on items 1, 3, 5, 9, 10, 12, 14, 16, 17, and 19. Scores can range from 10 – 50, with higher scores representing higher levels of positive affect. Mean Scores: Momentary = 29.7 ($SD = 7.9$); Weekly = 33.3 ($SD = 7.2$)

Negative Affect Score: Add the scores on items 2, 4, 6, 7, 8, 11, 13, 15, 18, and 20. Scores can range from 10 – 50, with lower scores representing lower levels of negative affect. Mean Score: Momentary = 14.8 ($SD = 5.4$); Weekly = 17.4 ($SD = 6.2$)

Copyright © 1988 by the American Psychological Association. Reproduced with permission. The official citation that should be used in referencing this material is Watson, D., Clark, L. A., & Tellegan, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, 54(6), 1063–1070.

Note: For the laboratory visits, participants were asked to report how they had felt over the last week. At each EMA assessment, participants were asked how they felt at that very moment and only rated items 1, 2, 3, 4, 7, 9, 12, 14, 15, and 20.

DIFFICULTIES IN EMOTION REGULATION SCALE (DERS)

Response categories:

- . 1 Almost never (0-10%)
- . 2 Sometimes (11-35%)
- . 3 About half the time (36-65%)
- . 4 Most of the time (66 – 90%)
- . 5 Almost always (91-100%)

1. I am clear about my feelings.
2. I pay attention to how I feel.
3. I experience my emotions as overwhelming and out of control.
4. I have no idea how I am feeling.
5. I have difficulty making sense out of my feelings.
6. I am attentive to my feelings.
7. I know exactly how I am feeling.
8. I care about what I am feeling.
9. I am confused about how I feel.
10. When I'm upset, I acknowledge my emotions.
11. When I'm upset, I become angry with myself for feeling that way.
12. When I'm upset, I become embarrassed for feeling that way.
13. When I'm upset, I have difficulty getting work done.
14. When I'm upset, I become out of control.
15. When I'm upset, I believe that I will remain that way for a long time.
16. When I'm upset, I believe that I'll end up feeling very depressed.
17. When I'm upset, I believe that my feelings are valid and important.
18. When I'm upset, I have difficulty focusing on other things.
19. When I'm upset, I feel out of control..
20. When I'm upset, I can still get things done.
21. When I'm upset, I feel ashamed with myself for feeling that way.
22. When I'm upset, I know that I can find a way to eventually feel better.
23. When I'm upset, I feel like I am weak.
24. When I'm upset, I feel like I can remain in control of my behaviors.
25. When I'm upset, I feel guilty for feeling that way.
26. When I'm upset, I have difficulty concentrating.
27. When I'm upset, I have difficulty controlling my behaviors.
28. When I'm upset, I believe there is nothing I can do to make myself feel better.
29. When I'm upset, I become irritated with myself for feeling that way.
30. When I'm upset, I start to feel very bad about myself.
31. When I'm upset, I believe that wallowing in it is all I can do.
32. When I'm upset, I lose control over my behaviors.
33. When I'm upset, I have difficulty thinking about anything else.
34. When I'm upset, I take time to figure out what I'm really feeling.

35. When I'm upset, it takes me a long time to feel better.
36. When I'm upset, my emotions feel overwhelming.

Appendix B: USUHS IRB Approval Letter



UNIFORMED SERVICES UNIVERSITY OF THE HEALTH SCIENCES

4301 JONES BRIDGE ROAD
BETHESDA, MARYLAND 20814-4799
www.usuhs.mil



March 14, 2012

MEMORANDUM FOR CPT AIMEE RUSCIO, MS, USA, MEDICAL AND CLINICAL PSYCHOLOGY

SUBJECT: USUHS IRB #1 (FWA 00001628; DoD Assurance P60001) Approval of TO72MR for Human Subjects Participation

Congratulations! The *Initial Review* for your no more than minimal risk human subjects research protocol TO72MR, entitled "Brief Mindfulness Meditation Training in Smokers," was reviewed and approved for execution on March 14, 2012 by Edmund Howe, M.D., J.D., Chair IRB #1 under the provision of 32 CFR 219.110(b)(1)Suppl.F(7). This approval will be reported to the USU IRB #1 scheduled to meet on April 12, 2012.

The purpose of this behavioral research study is to evaluate the effect of Brief Mindfulness Meditation (BMM) administered via PDA on thoughts and emotions related to smoking. The specific aims of the project are to determine the feasibility of a BMM delivered on a PDA for smoking, examine the effect of BMM on cognitive processes, affective processes, nicotine dependence, and smoking behavior, and examine attentional bias, a decentered perspective, positive affect, and negative affect as mediators of the relationship between BMM (vs. control) and tobacco dependence and smoking behavior. Up to 40 participants recruited from the Washington, D.C. metropolitan area will take part in this study.

Authorization to conduct protocol TO72MR will automatically terminate on March 13, 2013. If you plan to continue data collection or analysis beyond this date, IRB approval for continuation is required. Please submit a USU Form 3204 A/B, application for continuing approval 60 days prior to your termination date. You will receive a reminder from IRBNet.

You are required to submit amendments to this protocol, changes to the informed consent document (if applicable), adverse event reports, and other information pertinent to human research for this project in IRBNet. No changes to this protocol may be implemented prior to IRB approval. If you have questions regarding this IRB action or questions of a more general nature concerning human participation in research, please contact Micah Stretch at 301-295-0819 or mstretch@usuhs.mil.

This document has been signed electronically.

"Electronic Signature Notice: In accordance with the "Government Paperwork Elimination Act" (GPEA) (Pub.L. 105-277; codified at 44 USC 3504); Federal and DOD applicable instructions, directives and regulations, documents have been electronically signed and authorized by all who have been required to do so. These signatures have the same effect as their paper-based counterparts. Verification is retained within our protected electronic records and audit trails."

Appendix C: Informed Consent Document



UNIFORMED SERVICES UNIVERSITY OF THE HEALTH SCIENCES
4301 JONES BRIDGE ROAD
BETHESDA, MARYLAND 20814-4712
www.usuhs.mil



UNIFORMED SERVICES UNIVERSITY
BETHESDA, MARYLAND

This consent form is valid only if it contains the "USUHS IRB Approved" stamp. Do not sign this form or participate in this research if the IRB stamp is not present or if it has expired.

USUHS IRB APPROVED
12/28/2017
Expires: 12/28/2018

Consent for Voluntary Participation in a Non-Clinical Research Study

1. INTRODUCTION OF THE STUDY

You are being asked to be in a research study entitled "Brief Mindfulness Training in Smokers" at the Uniformed Services University of the Health Sciences (USUHS), Bethesda, Maryland. You have been asked to take part in this study because you are a smoker. Your participation is voluntary. Refusal to participate will not result in any punishment or loss of benefits to which you are otherwise permitted. Please read the information below, and ask questions about anything you do not understand, before deciding whether to take part in the study.

2. PURPOSE OF THE STUDY

The purpose of this behavioral research study is to evaluate the effect of mindfulness meditation on thoughts and emotions related to smoking. Results from this study may help researchers create more effective cessation (quitting) programs in the future. If you agree to be part of the study, and you are eligible, you will be randomly assigned to one of two training conditions. You will not know which condition you are in. This is the normal procedure in this type of study. In previous research by other investigators, the mindfulness training has been delivered in a group setting over the course of several weeks. This research has shown that mindfulness training can influence smokers' withdrawal symptoms, tobacco dependence, and smoking. In this study, we want to see if a self-administered, brief version of mindfulness training will effectively influence attention, perspective towards negative emotions, positive and negative emotions, and smoking. We are also interested in measuring these processes using a Personal Digital Assistant (PDA).

3. PROCEDURES TO BE FOLLOWED

If you are eligible, you will attend up to 3 laboratory sessions in Building 28 at USUHS over the course of two weeks. The first laboratory session will last about 120 minutes. The second and third laboratory sessions will last about 75 minutes. You first attend an orientation session (today's session). Research staff will answer any questions you may have. If you are eligible and you agree to be in this study, a research staff member will give you informational material describing mindfulness. You will be asked to complete some brief questionnaires assessing your demographics (such as your age and income), your smoking, and your personality. A research assistant will show you how to use the PDA. You will practice meditating while listening to a recording for approximately 20 minutes. You will complete an assessment on the

Subject's initials _____ Date _____
Witness initials _____ Date _____

Learning to Care for Those in Harm's Way

PDA. You will be given a smoking diary and asked to record the number of cigarettes you smoke each day for the next two weeks. You can smoke as much or as little as you like during the two weeks.

You will be asked to carry a PDA around with you for two weeks. The PDA will beep you at random times during the day (about 4 times each day). After the PDA beeps you, you will be asked to respond to a series of questions which ask you how you are feeling at that time. You will perform a reaction time task on the PDA. Each PDA assessment should last about 10 minutes in total.

You will be asked to practice meditation for twenty minutes each day for two weeks. The meditation recordings will be on the PDA. A research assistant will explain how to access the recordings. You may meditate at a time of your choosing. Following each meditation session, you will indicate that you have completed your meditation for the day on the PDA. After making that indication, you will complete a ten minute assessment similar to the assessment described above.

After one week, you will be asked to attend a second session at which time you will bring the PDA and the smoking diary. You will complete a series of reaction-time tasks and answer a series of questions in the laboratory. The session will last approximately one hour and fifteen minutes.

After an additional week, you will be asked to attend a third session at which time you will return the PDA and the smoking diary. You will again complete a series of reaction-time tasks and answer a series of questions in the laboratory. The session will last approximately one hour and fifteen minutes.

At each laboratory session, you will be asked to provide a breath sample and a saliva sample. The breath sample and the saliva sample will help the researchers find out how much you have smoked. At the orientation (first) session, the level of carbon monoxide in your breath must be above a certain level in order for you to be eligible for the study. Your craving for cigarettes will also be assessed.

When your participation in the study is over, you will be offered self-help materials for quitting smoking and a referral to smoking cessation programs.

4. NUMBER OF PEOPLE THAT WILL TAKE PART IN THIS STUDY

Up to 50 individuals are expected to participate in this study.

5. AMOUNT OF TIME FOR YOU TO COMPLETE THE STUDY

Participation of this study will require in total about 16 hours of your time over a period of about 2 weeks.

6. ELIGIBILITY AND PAYMENT FOR BEING IN THIS STUDY

Criteria: To qualify, you have to be current smokers, report smoking 10 or more cigarettes per day

Subject's initials _____ Date _____
 Witness initials _____ Date _____

USHS IRB APPROVED
 11/05/2012
 Expires: 11/05/2013

for the past two years, and be aged 18 – 65. If you are a federal civilian employee or member of the military you must have your supervisor’s approval for participation. Exclusion criteria are: expired breath carbon monoxide levels lower than 10 ppm; regular use of tobacco products other than cigarettes; current use of smoking cessation medications (bupropion, varenicline, or nicotine products); currently engaged in other treatment for tobacco cessation; or any other factor that, in the judgment of the investigators, would likely preclude completion of the protocol.

Participation:

Civilians and military personnel may participate in this study. Federal civilians and military personnel must provide the investigators with a signed Statement of Approval form.

Compensation:

Non-federal civilians may receive compensation for their participation in this study. Federal employees, military or civilian, cannot receive compensation for their participation.

Eligible non-federal civilians will receive \$50 for the orientation session and \$15 for the second laboratory session and the third laboratory session. Non-federal civilians will receive \$5 for each home meditation practice they complete and \$1 for each PDA assessment that they complete. If a non-federal civilian completes all scheduled PDA assessments, they will receive approximately \$215 (\$50 (orientation session) + \$15 (second laboratory session) + \$15 (third laboratory session) + (\$5 x 12) (home meditation practice) + (\$1 x 75) (PDA assessments)). Ineligible non-federal civilians will receive \$25.

A check will be mailed to civilians following completion of the study. Checks may take 4 to 6 weeks to be mailed.

7. POSSIBLE RISKS OR DISCOMFORTS FROM BEING IN THIS STUDY

The risks or discomforts from being in this study are expected to be minimal. There are no known risks associated with practicing meditation, completing the laboratory assessments, or the PDA assessments. There is no reason to believe that your smoking will be increased by participation in the study.

You may refuse to answer any question that makes you feel uncomfortable.

8. POSSIBLE BENEFITS FROM BEING IN THIS STUDY

There are no direct benefits associated with participating in this study. The information we learn may help develop better smoking cessation programs."

9. CONFIDENTIALITY/PRIVACY AND HOW YOUR IDENTITY AND YOUR RESEARCH RECORDS WILL BE MAINTAINED

All information you provide as part of this study will be confidential and will be protected to the fullest extent provided by law. Your responses to our laboratory and PDA assessments will be

Subject’s initials _____ Date _____
Witness initials _____ Date _____

USUHS IRE APPROVED
14 JULY 2012
Expires: 14 AUGUST 2012

maintained in a locked filing cabinet or on a password-protected computer in lab offices in the Department of Medical and Clinical Psychology. All records related to this study will be accessible to those persons directly involved in conducting this study and members of the USUHS Institutional Review Board (IRB), which provide oversight for protection of human research volunteers. In addition, the IRB at USUHS and other federal agencies that help protect people who are involved in research studies, may need to see the information you give us. Other than those groups, records from this study will be kept private to the fullest extent of the law. Scientific reports that come out of this study will not use your name or identify you in any way.

USUHS IRB APPROVED
11/25/2012
Expires: 11/25/2013

10. CONDITIONS WHICH YOUR PARTICIPATION IN THIS STUDY MAY BE STOPPED WITHOUT YOUR CONSENT

The investigator may stop you from taking part in this study if being in the study is unsafe or dangerous to you. The investigator may also stop you participating if you experience difficulty in following the procedures.

11. IF YOU DECIDE TO STOP TAKING PART IN THIS STUDY AND THE INSTRUCTIONS FOR STOPPING EARLY

You have the right to withdraw from this study at any time. If you decide to stop taking part in this study, you should tell the principal investigator as soon as possible. You may request that experimenters destroy all data and biological samples that you have submitted upon withdrawal. Data and samples submitted prior to withdrawal will be maintained and included in study analyses, unless destruction is requested upon withdrawal.

12. RECOURSE IN THE EVENT OF INJURY

If at any time you believe you have suffered an injury or illness as a result of participating in this research project, you should contact the Director of Human Research Protections Programs at the Uniformed Services University of the Health Sciences, Bethesda, Maryland 20814-4799 at (301) 295-9534. This office can review the matter with you, can provide information about your rights as a subject, and may be able to identify resources available to you. If you believe the government or one of the government's employees (such as a military doctor) has injured you, a claim for damages (money) against the federal government (including the military) may be filed under the Federal Torts Claims Act. Information about judicial avenues of compensation is available from the University's General Counsel at (301) 295-3028.

CONTACT FOR QUESTIONS OR PROBLEMS

If you have questions about this research, you should contact Aimee Ruscio, the person in charge of the study. Aimee's number at USUHS is 301 295-0802. Even in the evening or on weekends, you can leave a message at that number. If you have questions about your rights as a research subject, you should call the Director of Human Research Protections Programs at USUHS at (301) 295-9534. She is your representative and has no connection to the researcher conducting this study.

SIGNATURE OF RESEARCH PARTICIPANT OR LEGAL REPRESENTATIVE

You have read (or someone has read to you) the information in this consent form. You have

Subject's initials _____ Date _____
Witness initials _____ Date _____

been given a chance to ask questions and all of your questions have been answered to your satisfaction.

BY SIGNING THIS CONSENT FORM, YOU FREELY AGREE TO TAKE PART IN THE RESEARCH IT DESCRIBES.

USUHS IRB APPROVED
IRB # 11-001
Expires: 12/31/2013

Participant's Signature

Date

Participant's Printed Name

SIGNATURE OF INVESTIGATOR/RESEARCH TEAM MEMBER

You have explained the research to the participant, or his/her legal representative, and answered all of his/her questions. You believe that the volunteer subject understands the information described in this document and freely consents to participate.

Investigator's/Research Team Member's Signature Date (must be the same as the participant's)

Investigator's/ Research Team Member's Printed Name

SIGNATURE OF WITNESS

Your signature as witness is intended to attest that the information in the consent document and any other information was explained to and apparently understood by the participant, or the participant's legal representative, that questions and concerns were addressed and that informed consent was freely given.

Witness' Signature

Date (must be the same as the participant's)

Witness' Printed Name

Subject's initials _____ Date _____

Witness initials _____ Date _____

REFERENCES

1. Adams CE, Tull MT, Gratz KL. 2012. The role of emotional nonacceptance in the relation between depression and recent cigarette smoking. *The American journal on addictions / American Academy of Psychiatrists in Alcoholism and Addictions* 21:293-301
2. Anda RF, Williamson DF, Escobedo LG, Mast EE, Giovino GA, Remington PL. 1990. Depression and the dynamics of smoking. A national perspective. *Jama* 264:1541-5
3. Bradley B, DeFife JA, Guarnaccia C, Phifer J, Fani N, et al. 2011. Emotion dysregulation and negative affect: association with psychiatric symptoms. *Journal of Clinical Psychiatry* 72:685-91
4. Brandon TH. 1994. Negative Affect as Motivation to Smoke. *Current Directions in Psychological Science (Wiley-Blackwell)* 3:33-7
5. Brown RA, Lejuez CW, Kahler CW, Strong DR, Zvolensky MJ. 2005. Distress tolerance and early smoking lapse. *Clinical psychology review* 25:713-33
6. Carmody TP, Vieten C, Astin JA. 2007. Negative affect, emotional acceptance, and smoking cessation. *Journal of psychoactive drugs* 39:499-508
7. Cisler JM, Olatunji BO, Feldner MT, Forsyth JP. 2010. Emotion Regulation and the Anxiety Disorders: An Integrative Review. *J Psychopathol Behav Assess* 32:68-82
8. Diedrich A, Grant M, Hofmann SG, Hiller W, Berking M. 2014. Self-compassion as an emotion regulation strategy in major depressive disorder. *Behaviour research and therapy* 58:43-51
9. Ebner-Priemer UW, Kuo J, Kleindienst N, Welch SS, Reisch T, et al. 2007. State affective instability in borderline personality disorder assessed by ambulatory monitoring. *Psychological Medicine* 37:961-70
10. Egloff B, Schmukle SC, Burns LR, Schwerdtfeger A. 2006. Spontaneous emotion regulation during evaluated speaking tasks: associations with negative affect, anxiety expression, memory, and physiological responding. *Emotion (Washington, D.C.)* 6:356-66
11. Fox HC, Axelrod SR, Paliwal P, Sleeper J, Sinha R. 2007. Difficulties in emotion regulation and impulse control during cocaine abstinence. *Drug and alcohol dependence* 89:298-301
12. Grant BF, Hasin DS, Chou SP, Stinson FS, Dawson DA. 2004. Nicotine dependence and psychiatric disorders in the United States: results from the national epidemiologic survey on alcohol and related conditions. *Archives of general psychiatry* 61:1107-15
13. Gratz KL. 2007. Targeting emotion dysregulation in the treatment of self-injury. *J Clin Psychol* 63:1091-103
14. Gratz KL. 2014. E-mail correspondence. ed. J MacIntyre

15. Gratz KL, Roemer L. 2004. Multidimensional assessment of emotion regulation and dysregulation: Development, factor structure, and initial validation of the difficulties in emotion regulation scale. *Journal of Psychopathology and Behavioral Assessment* 26:41-54
16. Gross JJ. 2013. Emotion regulation: taking stock and moving forward. *Emotion (Washington, D.C.)* 13:359-65
17. Harrison A, Tchanturia K, Treasure J. 2010. Attentional bias, emotion recognition, and emotion regulation in anorexia: state or trait? *Biological psychiatry* 68:755-61
18. Heckman BW, Kovacs MA, Marquinez NS, Meltzer LR, Tsambarlis ME, et al. 2013. Influence of affective manipulations on cigarette craving: a meta-analysis. *Addiction (Abingdon, England)* 108:2068-78
19. Hedeker D, Demirtas H, Mermelstein RJ. 2009. A mixed ordinal location scale model for analysis of Ecological Momentary Assessment (EMA) data. *Statistics and its interface* 2:391-401
20. Holtmann M, Buchmann AF, Esser G, Schmidt MH, Banaschewski T, Laucht M. 2011. The Child Behaviors Checklist-Dysregulation Profile predicts substance use, suicidality, and functional impairment: a longitudinal analysis. *The Journal of Child Psychology and Psychiatry* 52:139-47
21. Kassel JD, Evatt DP, Greenstein JE, Wardle MC, Yates MC, Veilleux JC. 2007. The acute effects of nicotine on positive and negative affect in adolescent smokers. *Journal of abnormal psychology* 116:543-53
22. Klemanski DH, Mennin DS, Borelli JL, Morrissey PM, Aikins DE. 2012. Emotion-related regulatory difficulties contribute to negative psychological outcomes in active-duty Iraq war soldiers with and without posttraumatic stress disorder. *Depression and Anxiety* 29:621-8
23. Kober H. 2013. Emotion Regulation in Substance Use Disorders. In *Handbook of Emotion Regulation*, ed. JJ Gross. New York, NY: The Guilford Press. Number of.
24. Lavender JM, Tull MT, DiLillo D, Messman-Moore T, Gratz KL. Under Review. Title. Volume:In press
25. Linehan M. 1993. *Cognitive-Behavioral Treatment of Borderline Personality Disorder*. New York: The Guilford Press
26. Martin RC, Dahlen ER. 2005. Cognitive emotion regulation in the prediction of depression, anxiety, stress, and anger. *Personality and Individual Differences* 39:1249-60
27. McKenzie KC, Gross JJ. 2014. Nonsuicidal self-injury: an emotion regulation perspective. *Psychopathology* 47:207-19
28. Payne TJ, Schare ML, Levis DJ, Colletti G. 1991. Exposure to smoking-relevant cues: effects on desire to smoke and topographical components of smoking behavior. *Addictive behaviors* 16:467-79
29. Pratt LA, Brody DJ. 2010. Depression and smoking in the U.S. household population aged 20 and over, 2005-2008. ed. NHa Nutrition: U.S. Department of Health and Human Services
30. Quigley KS, Lindquist KA, Barrett LF. 2014. Inducing and measuring emotion and affect: Tips, tricks, and secrets. In *Handbook of Research Methods in*

- Personality and Social Psychology*, ed. H Reis, C Judd. New York: Oxford University Press. Number of.
31. Ruscio A. 2013. *Brief mindfulness meditation training in smokers*. Uniformed Services University of the Health Sciences
 32. Russell JA. 2003. Core affect and the psychological construction of emotion. *Psychological Review* 110:145-72
 33. Shiffman S. 1993. Assessing smoking patterns and motives. *Journal of consulting and clinical psychology* 61:732-42
 34. Shiffman S. 2005. Dynamic influences on smoking relapse process. *Journal of Personality* 73:1715-48
 35. Shiffman S, Stone AA, Hufford MR. 2008. Ecological momentary assessment. *Annual review of clinical psychology* 4:1-32
 36. Shiffman S, Waters AJ. 2004. Negative affect and smoking lapses: a prospective analysis. *Journal of consulting and clinical psychology* 72:192-201
 37. Silk JS, Steinberg L, Morris AS. 2003. Adolescents' emotion regulation in daily life: links to depressive symptoms and problem behavior. *Child development* 74:1869-80
 38. Silvers JA, Wager TD, Weber J, Ochsner KN. 2014. The neural bases of uninstructed negative emotion modulation. *Social cognitive and affective neuroscience*
 39. Sjöberg L, Johnson T. 1978. Trying to give up smoking: A study of volitional breakdowns. *Addictive behaviors* 3:149-64
 40. Stevens SL, Colwell B, Smith DW, Robinson J, McMillan C. 2005. An exploration of self-reported negative affect by adolescents as a reason for smoking: implications for tobacco prevention and intervention programs. *Preventive medicine* 41:589-96
 41. Svaldi J, Griepenstroh J, Tuschen-Caffier B, Ehring T. 2012. Emotion regulation deficits in eating disorders: a marker of eating pathology or general psychopathology? *Psychiatry research* 197:103-11
 42. Watson D, Clark LA, Tellegen A. 1988. Development and validation of brief measures of positive and negative affect: the PANAS scales. *Journal of personality and social psychology* 54:1063-70
 43. Webb TL, Miles E, Sheeran P. 2012. Dealing with feeling: a meta-analysis of the effectiveness of strategies derived from the process model of emotion regulation. *Psychological bulletin* 138:775-808