Dysphoria and Dysregulation: Exploration of Affect and Dissociation in the Pain Response to Non-Suicidal Self-Injury

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DYSPHORIA AND DYSREGULATION: EXPLORATION OF AFFECT AND DISSOCIATION IN THE PAIN RESPONSE TO NON-SUICIDAL SELF-INJURY

by

Rita Eileen Todd

Abstract of a Dissertation
Submitted to the Graduate School
of The University of Southern Mississippi
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Philosophy

December 2014
ABSTRACT

DYSPHORIA AND DYSREGULATION: EXPLORATION OF AFFECT AND DISSOCIATION IN THE PAIN RESPONSE TO NON-SUICIDAL SELF-INJURY

by Rita Eileen Todd

December 2014

Research on non-suicidal self-injury (NSSI) has largely demonstrated increases in pain threshold and pain tolerance in those individuals who have engaged in NSSI, even if they no longer engage in these behaviors (Hooley, Ho, Slater, & Lockshin, 2010). However, little research has been conducted on the mechanisms for these alterations in pain response. Moreover, explorations of these factors often focused on clinical samples despite the growing prevalence of NSSI in adolescents and young adults who are not in treatment. To address these concerns, college students with and without a history of NSSI ($N = 69$) aged 18 to 53 ($M = 19.61, SD = 1.97$), completed self-report measures of affect, dissociation, and pain attitudes, and then completed a laboratory pain paradigm (i.e., cold pressor task) assessing pain threshold and pain tolerance. Immediately before and immediately after the cold pressor task, positive and negative affect were assessed. It was predicted that (1) groups would differ on pain threshold and tolerance based on history of NSSI, (2) psychological factors including affect, dissociation, and pain attitudes would predict increased pain threshold and pain tolerance, (3) these factors would also predict increases in positive and negative affect following the completion of the cold pressor task and, (4) the interaction between dissociation, and negative affect would moderate the relationship between history of NSSI and pain threshold and pain tolerance. Results indicated that there were group differences in pain responses based on history of NSSI;
though individual predictors of increased pain threshold and tolerance and increased positive and negative affect following pain paradigm were not found to be significant, trends suggested a role of pain catastrophizing and borderline personality traits (such as intrusive and self-destructive symptoms). Lastly, a three-way interaction between NSSI frequency, dissociation, and negative affect significantly predicted pain threshold but did not predict pain tolerance. Theoretical and clinical implications, limitations, and suggestions for future research are discussed.
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# TABLE OF CONTENTS

ABSTRACT..........................................................................................................................................ii

ACKNOWLEDGMENTS..........................................................................................................................v

LIST OF TABLES.................................................................................................................................vii

CHAPTER

I. INTRODUCTION AND REVIEW OF RELATED LITERATURE........1
   Terminology in the Study of Non-Suicidal Self-Injury
   Function of Non-Suicidal Self-Injury
   Association Between Pain and Non-Suicidal Self-Injury
   Physiological Findings Regarding Pain and Non-Suicidal Self-Injury
   Association Between Dissociation and Non-Suicidal Self-Injury
   Physiological Findings Regarding Pain and Dissociation
   Association Between Affect and Non-Suicidal Self-Injury

II. METHOD........................................................................................................................................24
   Participants
   Design
   Measures
   Procedure
   Data Preparation and Hypothesis Testing Procedure

III. RESULTS......................................................................................................................................34
   Descriptive Statistics
   Correlations
   Tests of Hypotheses

IV. DISCUSSION..............................................................................................................................54
   Goal of Current Study
   Limitations of the Current Study
   Strengths of the Current Study
   Suggestions for Future Research
   Conclusions

APPENDIXES....................................................................................................................................71

REFERENCES.......................................................................................................................................132
LIST OF TABLES

Table
1. Descriptive Statistics, Parent Scales .................................................................35
2. Descriptive Statistics, Parent Scales (No-NSSI Group) .................................36
3. Descriptive Statistics, Parent Scales (Past-NSSI Group) ...............................36
4. Descriptive Statistics, Parent Scales (Current-NSSI Group) .........................37
5. Descriptive Statistics, Subscales ......................................................................37
6. Descriptive Statistics, Subscales (No-NSSI Group) ........................................38
7. Descriptive Statistics, Subscales (Past-NSSI Group) .......................................38
8. Descriptive Statistics, Subscales (Current-NSSI Group) .................................39
10. Descriptive Statistics, Affect, and Pain Response (No-NSSI Group) ............40
12. Descriptive Statistics, Affect, and Pain Response (Current-NSSI Group) ....40
13. Correlations Between Pain Threshold, Pain Tolerance, and Psychological Variable Parent Scales ..........................................................................................41
14. Correlations Between Pain Threshold, Pain Tolerance, and Psychological Variable Subscales ........................................................................................................42
15. Correlations Between PANAS Change Scores (Pre- and Post-CPT) and Psychological Variable Parent Scales .................................................................42
16. Correlations Between Pre- and Post-CPT Affect and Psychological Variable Subscales ............................................................................................................43
17. Parent Scale Predictors of Increased Pain Threshold (With Significant Correlates Of .350 Magnitude or Greater) .................................................................44
18. Subscale Predictors of Increased Pain Threshold (With Significant Correlates of .350 Magnitude or Greater) .................................................................45
19. Parent Scale Predictors of Increased Pain Threshold (With Significant Correlates Of .250 Magnitude or Greater)..............................................................................45
20. Subscale Predictors of Increased Pain Threshold (With Significant Correlates of .250 Magnitude or Greater)..............................................................................46
21. Parent Scale Predictors of Increased Pain Tolerance (With Significant Correlates Of .250 Magnitude or Greater)..............................................................................47
22. Subscale Predictors of Increased Pain Tolerance (With Significant Correlates of .350 Magnitude or Greater)..............................................................................47
23. Subscale Predictors of Increased Pain Tolerance (With Significant Correlates of .250 Magnitude or Greater)..............................................................................48
24. Parent Scale Predictors of Decreased Negative Affect (With Significant Correlates of .250 Magnitude or Greater)..............................................................................49
25. Subscale Predictors of Decreased Negative Affect (With Significant Correlates Of .350 Magnitude or Greater)..............................................................................49
26. Subscale Predictors of Decreased Negative Affect (With Significant Correlates Of .250 Magnitude or Greater)..............................................................................50
27. Subscale Predictors of Decreased Positive Affect (With Significant Correlates of .250 Magnitude or Greater)..............................................................................51
28. Proposed Moderation of Dissociation and Pre-CPT Negative Affect Between NSSI Frequency and Pain Threshold..............................................................................51
29. Conditional Effect of NSSI Frequency and Dissociation Interaction at Values of Negative Affect..............................................................................52
30. Proposed Moderation of Dissociation and Pre-CPT Negative Affect Between NSSI Frequency and Pain Tolerance..............................................................................53
CHAPTER I

INTRODUCTION AND REVIEW OF RELATED LITERATURE

Non-suicidal self-injury, or NSSI, has increasingly been explored both clinically and empirically. A number of mechanisms for NSSI have been posited (Klonsky, 2007) and correlates have been explored including demographic (Laye-Gindhu & Schonert-Reichl, 2005), psychological (Gratz & Roemer, 2008; Polk & Liss, 2007), and physiological variables (Stanley, Sher, Wilson, Ekman, Huang, & Mann, 2010). The current project will include a review of NSSI and will examine the roles played by pain tolerance and threshold as well as dissociation, and affect (both positive and negative) in predicting non-suicidal self-injury.

Terminology in the Study of Non-Suicidal Self-Injury

One hindrance to the widespread dissemination of information regarding self-injury is the variety of behaviors described as NSSI. For example, unhealthy behaviors such as smoking or overeating have sometimes been labeled self-destructive behaviors on par with deliberately cutting the skin (Croyle & Waltz, 2007). Also unclear is the term parasuicidal behavior that has been used to describe NSSI, but also includes attempted suicide, and thus findings may or may not apply specifically to NSSI or suicide (O’Connor, Armitage, & Gray, 2006). While the functions of self-injury are varied, NSSI typically occurs without conscious suicidal intent, and as such, including suicide attempts within the label of parasuicidal behavior makes it difficult to discern the risk factors, predictors, and correlates of each respective behavior. In an effort to establish more uniform definitions for such behaviors, Crosby, Ortega, and Melanson (2011) labeled behavior that is self-directed and deliberately results in injury or the potential for injury to
oneself as *self-directed violence*, which could be further categorized as *non-suicidal self-directed violence* when there is no evidence of suicidal intent.

Additionally, cultural factors must also be considered in examinations of NSSI, as a number of cultures also engage in forms of intentional self-injury through body modification. These modifications range from the Muri of Ethiopia who insert large plates into the lower lip (Favazza, 1996) to forms of body modification accepted in many cultures, including piercings and tattoos (and more recently branding and scarification). Importantly, individuals with these alterations overwhelmingly report these modifications are motivated by a desire for beauty and artistic expression rather than for relief from aversive emotional states (Aizenman & Conover-Jensen, 2008).

Immediate and direct destruction of body tissues may also occur both in self-mutilating behavior, such as auto-castration or amputation of limbs (which often occurs in response to command hallucinations), or self-injurious behavior seen in individuals with mental retardation. While these injuries may take the same form as NSSI, the motivation for engaging in these acts differs and may not be under conscious control (Matson, Cooper, Malone & Moskow, 2008).

For the purposes of the current research, behaviors that are immediate, deliberate and voluntary acts committed with the intention of damaging one’s own body tissues without suicidal intent will be referred to as non-suicidal self-injury (NSSI; Nock & Favazza, 2009).

**Function of Non-Suicidal Self-Injury**

Nock and Prinstein (2004) described four purposes of NSSI from a functional perspective: intrapersonal negative reinforcement (e.g., decrease in inner tension), intrapersonal positive reinforcement (e.g., self-stimulation), interpersonal positive
reinforcement (e.g., attention, support), and interpersonal negative reinforcement (e.g.,
decrease or cessation of negative social event).

Klonsky (2007) also proposed functions of NSSI, including affect regulation, anti-
dissociation, anti-suicide, interpersonal boundaries, interpersonal influence, self-
punishment, and sensation seeking. With regard to affect regulation, NSSI is proposed as
a coping strategy intended to reduce dysphoria resulting from overwhelming emotions.
NSSI as a means of preventing or ending dissociation (separation of elements of the self
from conscious thought and control often in response to overwhelming stress) is posited
to end dissociation, depersonalization, or derealization by *grounding* the self through
immediate physical pain. The stimuli and sensations experienced during self-injury,
whether it is the sight of blood or the sensation of pain, end the dissociative feelings or
generate feelings to counteract numbness. While often confused with suicidality, Klonsky
delineates an anti-suicide function whereby NSSI either reinforces the sense of being
alive or indirectly by reducing dysphoria which may contribute to the urge for suicide.

The idea that NSSI is a way to affirm interpersonal boundaries comes from
object-relations theory (Klonsky, 2007). Those with insecure attachments may lack the
typical sense of self, and will then mark the skin (in any number of ways) in order to
express a distinction between themselves and others. This theory has fallen out of favor
as an explanation for NSSI more recently, as it is reported as a function much less often
than others.

Interpersonal influence as a reason for NSSI can mean multiple things, including
communicating distress to others. Many who self-injure initially keep the evidence of
their behavior secret (injuring in places that are usually covered, or wearing long sleeves
and pants year round). When done often it may inevitably come to the attention of others.
This can be done in a manipulative way, such as the individual fearing abandonment that engages in NSSI in order to keep a significant other from leaving. Conversely, NSSI may be an attempt to convey an urgent need for help and to obtain care (Paris, 2005).

NSSI as self-punishment can be related to feelings of guilt or anger that cannot be expressed, perhaps modeled in early invalidating environments where a child learns to direct negative feelings inwards and this becomes a way of self-soothing. Lastly, NSSI may be motivated by sensation seeking, which is notably different from the previously mentioned feeling generation. Sensation seeking in NSSI is meant to indicate generating a feeling of excitement, rather than generation of feeling to reduce dissociation. Klonsky (2007) compares this to sky-diving or bungee jumping in order to produce exhilaration.

Association Between Pain and Non-Suicidal Self-Injury

As research has explored unique functions and correlates of self-injury, a trend emerged demonstrating a subset of individuals who engage in NSSI exhibit an altered pain response, reporting either low levels of pain (hypoalgesia) or the absence of pain entirely during the time of self-injury (analgesia; Ballard, Bosk, & Pao, 2010). Further exploration of pain perception in laboratory-based assessments of pain have examined both pain thresholds (the point at which a stimulus is regarded as painful) and pain tolerance (the amount of time the participant experienced the painful stimulus before voluntarily discontinuing exposure to that stimulus).

Hooley and colleagues (2010) utilized a pressure algometer (a device that creates focal pressure similar to the sensation of a dull butter knife pressed into the skin) to determine pain threshold and pain tolerance in participants who had a history of self-injury versus controls. Results showed those who had a history of self-injury had both significantly higher pain thresholds and pain tolerance than controls. Even when higher
pain threshold was controlled for, individuals with a history of NSSI still had a significantly higher level of pain tolerance. Notably, though only 3 control participants (10.3%) reached the 8-minute maximum on pain trials, 14 (46.6%) participants who had self-injured reached this maximum, a significant difference. Additionally, within those with a positive history of NSSI, a significant relationship was found between pain threshold and the duration (in years) of self-injury in that those with a lengthier history of self-injury took longer to report feeling the sensation of pain (Hooley et al., 2010).

Conversely, Gordon and colleagues (2010) found participants with a greater frequency of NSSI episodes reported more intense physical pain during their most recent self-injury, despite greater feelings of relief, soothing, and calmness after this same episode. This finding is discussed in further detail below.

It is clear that most research on the experience of pain in NSSI has been conducted with samples of patients diagnosed with borderline personality disorder. While NSSI does not occur exclusively in the context of borderline personality disorder, it is common among BPD patients, with most studies showing a prevalence of NSSI between 70 to 80% in BPD patients (Linehan, 1993). Additionally, the only mention of NSSI in the previous Diagnostic and Statistical Manual of Mental Disorders (APA, 2000) occurred in the diagnostic criteria for BPD, and as such most research on pain during NSSI has been conducted using clinical samples of patients diagnosed with BPD.

Cárdenas-Morales and colleagues (2011) report 70% of patients diagnosed with borderline personality disorder (BPD) who self-injured, exhibited either low or no pain perception at the time of self-injury. This is commensurate with earlier research which demonstrated patients diagnosed with borderline personality disorder who engaged in NSSI reached their pain threshold later than healthy controls in laboratory paradigms of
pain (Ludäscher et al., 2007). This finding has been demonstrated for BPD patients in both acutely stressed and non-stressed conditions, arguing against a state-related mechanism for hypoalgesia (such as negative affect; Ballard et al., 2010). However, this mechanism has not been studied as extensively in non-clinical populations.

In order to assess cognitive elements of pain sensitivity, Russ and colleagues (1996) examined pain expectations in a group of BPD patients with a history of self-injury and controls with no psychiatric diagnoses or history of self-injury. Feeling no pain during self-injury was operationalized as perceiving “no pain or touch/pressure during 75% of episodes, and no more than slight discomfort during the remaining 25%” (Russ et al., 1996, p. 59). Findings indicated that the reported ability to ignore pain on the Dissociative Experiences Scale (item 19; Bernstein & Putnam, 1986) significantly discriminated between BPD patients with minimal pain during self-injury, BPD patients who experienced pain during self-injury, and control participants.

Further, patients with minimal pain response during self-injury were less able to discriminate between imaginary severely painful and mildly painful scenarios, and were less likely to rate situations as painful in comparison to control participants. The authors report the impaired ability to discriminate between expected levels of painful stimuli has been found to predict decreased sensitivity to pain (Russ et al., 1996).

Pain attitudes are also likely to affect perceived sensitivity; as Sullivan, Bishop, and Pivik (1995) described a consistent relation between pain catastrophizing and distress reactions to painful stimulation. These researchers found that individuals high on pain catastrophizing reported significantly greater pain than noncatastrophizers during a cold pressor task; however, there was no analysis of effects of pain catastrophizing on pain threshold or tolerance in that study (Sullivan et al., 1995).
Bohus and colleagues (2000) recognized previous research on pain response in BPD patients typically had not controlled for possible medication effects. Their research examined the pain perception of BPD patients who report no pain during NSSI who had been medication free for two weeks (in the case of anti-depressants) and four weeks (in the case of neuroleptics). Additionally, pain perception was assessed in these patients in a calm (distress free) state as well as when distressed (and reporting a high urge to self-injure). Results indicated BPD patients exhibited reduced sensitivity to pain compared to controls, though their self-report indicated no difference in feelings of distress. Additionally, when BPD patients experienced high levels of distress, pain sensitivity was significantly decreased from their baseline calm state. The researchers acknowledged the lack of clarity in their attempts to account for this finding, particularly whether pain is decreased due to neurosensory alterations or changes in attitudinal components of pain. However, they point to dissociative processes influencing pain experience as patients reported a number of dissociative symptoms during acute episodes of distress, including alterations in vision, sound, and kinesthesia (Bohus et al., 2000).

Interestingly, even among individuals who do not engage in self-injury, pain is experienced as less intense when the painful stimulus is self-administered. Braid and Cahusac (2006) used a pressure algometer to induce pain sensations with participants who controlled the administration of the algometer (both pressure and duration) on 2 of 6 trials. Pain responses on those trials were compared to pain responses for trials where an experimenter administered the algometer. When trials were self-administered both pain threshold and tolerance were significantly higher than when the algometer was applied by either male or female research assistants. One explanation for this effect may be that when the algometer was self-administered, the participant had set expectations for the
intensity of pain based on their own application. When administered by a research assistant, anxiety may have increased due to the participant’s expectations and/or lack of trust of the other individual (Braid & Cahusac, 2006).

There is evidence that pain response begins to return to a baseline approaching that of healthy individuals after a period where self-injury is not engaged in. Ludäscher and colleagues (2009) found patients who had engaged in NSSI within the previous two weeks demonstrated higher pain thresholds than patients who had previously engaged in NSSI, but not within the previous six months, and both groups demonstrated higher pain thresholds than control participants who had never engaged in NSSI. Given the evidence for an affective component to pain, the question remains whether this return to “normal” pain response occurs as the individual becomes able to regulate their emotions and no longer engages in NSSI for regulation of mood.

Those who self-injure may not necessarily have higher initial pain thresholds and tolerance but could easily habituate to painful experiences. Hooley and colleagues (2010) point out that some individuals may experiment with self-injury but are sensitive to pain and do not repeat this behavior. Those without sensitivity to pain could repeat the self-injury and begin to habituate to that amount of pain until the injury becomes more and more damaging. However, this finding does not explain how some individuals who self-injure are still sensitive to pain (e.g., chronic pain conditions).

The findings from Gordon et al. (2010) suggest that Solomon’s (1980) opponent processes theory may play a role in such a situation. Solomon proposed pleasure-seeking behaviors are driven by two components – an A reaction and a B reaction. The A reaction is typically short-lived and intense, while the B reaction (of the opposite hedonic value) is often slower to build and slower to decay (similar to the long lasting changes elicited by
secondary messengers in metabotropic receptors). Solomon gives the example of a child who is in a good mood after being given a lollipop who begins crying when that lollipop is taken away, rather than returning to a neutral mood. As it applies to NSSI, the A reaction (short-lived intense pain) will elicit the B reaction (soothing, more pleasurable feelings). This theory also explains why individuals habituate to the fear of painful stimuli or even actively seek out situations or engage in behaviors with high risk of harm in order to elicit greater reinforcement. As such, a greater frequency of painful and provocative life events is likely to influence the overall response to pain, as well as change in affect following the experience of pain.

Physiological Findings Regarding Pain and Non-Suicidal Self-Injury

Naloxone, an opiate antagonist, has been shown to be effective in reducing NSSI, and is hypothesized to work by removing the reinforcing properties of the body's release of endorphins (or perhaps dopamine) following self-injury (Kreisman & Straus, 2004). However, the majority of the research which shows this effect for Naloxone has used samples of individuals with developmental disabilities who self-injure (Sandman et al., 1993), therefore results may not be generalizable to other populations. In one study using a BPD sample, participants who reported experiencing no pain during self-injury reported significantly more pain during a cold pressor task following administration of Naloxone (Russ, Roth, Kakuma, Harrison & Hull, 1994).

There is growing evidence that endogenous opioids are involved in the pain experience of NSSI, but more recent physiological research also suggests endogenous opioids play a role in dissociative experiences as well (Bandelow, Schmahl, Falkai, & Wedekind, 2010). Dissociation must also be considered in the examination of elevated
pain threshold and tolerance, particularly as both dissociation and pain experience share
the association with endogenous opioids.

Substance P, a neurokinin peptide widely distributed throughout the nervous
system, has been identified in the cingulate cortex, nucleus accumbens, hippocampus and
amygdala, among other areas implicated in the response to stress and anxiety (Ebner &
Singewald, 2006). Research has demonstrated alterations in substance P following
exposure to emotional, physical, and painful stressors. Notably, substance P exerts
different effects based on the region and dose affected. In rat studies, increases in
substance P in the dorsal periaqueductal gray, lateral septal nucleus, and medial amygdala
elicited anxiogenic responses while increases in the nucleus basalis magnocellularis
elicted anxiolytic effects (Ebner & Singewald, 2006). That opposing effects could be
elicited by the same stimuli in different regions of the brain could point to a function of
substance P in pain sensation and perception including for those individuals who vacillate
in their tendency to avoid pain or actively seek it out.

Association Between Dissociation and Non-Suicidal Self-Injury

Dissociation has been connected to the act of self-injury in multiple ways. In
some instances, the individual who engages in self-injury does so to eliminate
uncomfortable feelings brought about by an instance of dissociation. Other research
shows that individuals who have engaged in self-injury may experience dissociation as a
result of the injury, in which pain is dulled (Zlotnick et al., 1996). Lastly, dissociation and
NSSI may have a more reciprocal relationship where both serve to regulate affect. In this
way, self-injury may occur in order to bring about dissociation during times of
overwhelming negative emotion, or dissociation may occur following negative emotion
which contributes to feelings of discomfort that are ended by self-injury.
Zweig-Frank, Paris, and Guzder (1994) examined the association between dissociation and self-injury in a psychiatric setting and found wrist-cutting was common in female patients diagnosed with BPD. The researchers suggest these patients self-injured in order to gain relief from dissociative states, in essence, using self-injury as a grounding technique (to reduce feelings of depersonalization and derealization). The stimuli and sensations experienced during self-injury, be it the sight of blood or the sensation of pain, is intended to end the dissociative feelings. This pattern has also been described by some as feeling generation and is a commonly endorsed reason for self-injury (Brown, Comtois, & Linehan, 2002). In a qualitative study of the experience of NSSI during dissociation, some women reported feeling as if the cut "was to another person's arm, not really mine" (Huband & Tantam, 2004, p. 421). Others reported amnesia during the action or numbness at the time of the wound.

Similar to the work of Zweig-Frank, Paris, and Guzder (1994), Saxe and colleagues (2002) compared rates of self-injury in psychiatric patients diagnosed with dissociative disorders and patients with few dissociative traits. Results showed 86% of patients with dissociative disorders engaged in self-injury compared to 46% in the control group. Significant differences were noted in that onset of first self-injury was earlier in the dissociative disorder group, as well as a higher number of methods for, and lifetime frequency of self-injury.

Dissociation was also found to predict number of self-injury methods and overall frequency in a sample at a Japanese juvenile detention center. Those who reported self-cutting as well as self-burning had higher scores on the adolescent form of the Dissociative Experiences Scale (Matsumoto et al., 2005) than those who reported only one form of self-injury. The authors had previously found a relationship between self-
cutting and elevated levels of dissociation, but found these effects to be stronger when self-burning was taken into account. The finding that individuals who endorsed self-cutting and self-burning reported more traumas in childhood (such as bullying, sexual abuse, and physical abuse) may shed some light on this relationship. The authors posit dissociation likely serves as a mediator between childhood traumatic experiences and self-injury.

While the association between dissociation and self-injury has been supported in research for decades, there continues to be a dearth of research addressing the temporal relationship between dissociation and self-injury (e.g., which is the antecedent and which is the consequence). Further, inconsistent results have been found for those studies which have explored this temporal relationship.

Horowitz and Telch (2007) induced a dissociative state using audiophotic stimuli and found no significant change in pain tolerance following an experimental pain paradigm, suggesting state dissociation alone was not responsible for analgesia or lack thereof. The researchers report a number of possible explanations for this finding, emphasizing dissociation may not contribute to analgesia but rather the experience of the two may be concurrent. Additionally the authors point out the state change in dissociation may have reached statistical significance but may not have been sufficient to produce analgesia in their participants.

Bracken, Berman, McCloskey, and Bullock (2008) also examined the temporal relationship between dissociation and self-injury using a laboratory paradigm of self-administered electric shock. Participants were divided into two shock conditions with one group instructed to self-administer a shock equivalent to half of their pre-determined pain threshold and the other instructed to self-administer a shock twice the intensity of their
pre-determined pain threshold. In each condition, half the participants were given a state dissociation measure referencing the 90-second waiting period prior to self-administered shock or the 90-second period post shock. The researchers reported significantly greater levels of reported post-shock dissociation for females in the intense-shock condition.

Ludäscher and colleagues (2007) also considered both state and trait dissociation as factors influencing pain experience in a study where BPD patients and controls completed a pain paradigm using electrical pulses. Significant and strong ($r > .80$) correlations were found between pain thresholds and both state and trait dissociation, as well as pain thresholds and aversive arousal (negative affect; tension, depression, anger, anxiety) in BPD patients only.

**Physiological Findings Regarding Pain and Dissociation**

Dissociation has frequently been associated with capacity for hypnosis (Giolas & Sanders, 1992); the literature on hypnosis and modulation of pain provides insight into the neurobiology of dissociation. Faymonville, Boly, and Laureys (2006) noted during hypnosis marked decreases in activity were observed in the precuneus, an area of the brain implicated in various states of consciousness, anesthesia, and amnesia. Further, in a PET study healthy participants were engaged in a hypnotic induction and then completed a pain paradigm. These researchers reported hypnosis decreased pain unpleasantness and intensity in those individuals following hypnosis and pointed to mediation by the anterior cingulate cortex (ACC) in the reduction of pain perception. Notably, the ACC has been implicated in the regulation of cognition, sensory perception, and motor control in response to attentional, motivation, and emotional states; hypnosis may work by inhibiting the emotional valence of pain with suppression of activity between the sensory cortex and the limbic system. (Faymonville et al., 2006).
The association between dissociation and pain experience during self-injury may be best explained by shared physiologic functioning. In an examination of EEG wave activity and pain response in a laboratory pain paradigm (using the cold pressor task), Russ, Campbell, Kakuma, Harrison, and Zanine (1999) included a sample of BPD patients with differing levels of pain during self-injury, patients with major depression (MDD) without comorbid BPD, and a control group. Results showed BPD patients who experienced analgesia during NSSI had significantly greater cortical theta wave activity compared to BPD patients who experienced pain during NSSI, patients with major depression, and control participants.

These findings are important for two reasons. First, cortical theta wave activity in humans is associated with dissociative experiences and indifference to pain is related to dissociative states (Russ et al., 1999). Second, these results point to the additive influence of dissociation (over negative affect alone) in producing hypoalgesia or analgesia during NSSI as a sample of patients diagnosed with major depression did not show evidence of analgesia during the cold pressor task. If analgesia had been initiated simply by high negative affect and low positive affect, MDD patients would be expected to have pain responses similar to BPD patients.

The association between dissociation and endogenous opioids must be considered with regard to pain during self-injury, in that certain opioids may actually precede self-injury by triggering dissociative symptoms. Bandelow and colleagues (2010) point to dysregulation of κ-receptor activity during stress as a factor involved in feelings of derealization and depersonalization, while other endogenous opioids (such as β-endorphins and met-enkephalins) are released upon self-injury that produces bleeding. The researchers add that this endorphin release only occurs when the injury results in
bleeding, which is supported by clinical findings that non-bleeding injuries (such as head-banging) occur less frequently than behaviors that do (e.g., cutting).

There have been few formal studies of the importance of viewing blood during self-injury, though clinical and anecdotal reports suggest self-cutting is often the preferred form of self-injury. Glenn and Klonsky (2010) assessed the importance of viewing blood in an undergraduate sample of self-injurers and found roughly half of the sample reported it was important for them to view blood. For this subsample the three most reported functions endorsed for viewing blood were relief of tension, to produce calmness, and to produce feelings of reality. These desired effects would occur after the release of endogenous opioids upon the sight of blood.

Stanley and colleagues (2010) examined levels of three endogenous opioids (β-endorphin, met-enkephalin and dynorphin) in the cerebrospinal fluid (CSF) of 29 psychiatric patients, half of whom had engaged in repeated NSSI. Results demonstrated significantly lower CSF concentrations of β-endorphin and met-enkephalin in those with a history of NSSI. The researchers propose a homeostasis model of NSSI and functioning of the endogenous opioid system where self-injury is engaged in to increase both β-endorphin and met-enkephalin, which the researchers stated is chronically lower in some individuals due to childhood neglect or genetic vulnerability. In this way, self-injury restores homeostasis in individuals with deficient baseline levels of these opioids.

Though the relation between dissociation and NSSI has been established and supported in multiple empirical studies (Brown et al., 2002; Huband & Tantam, 2004), hypoalgesia and analgesia during self-injury cannot be accounted for by dissociation alone. This is especially important as not all individuals engage in self-injury to end dissociation. Some individuals self-injure to bring about a dissociative state as a means of
numbing physical as well as emotional pain. In addition to anti-dissociation and analgesic functions, there is growing evidence that NSSI serves to regulate emotion by reducing overwhelming negative affect, and, in some cases, increasing positive affect.

**Association Between Affect and Non-Suicidal Self-Injury**

In a review of emotional modulation of pain in psychological disorders, Klossika and colleagues (2006) point to Lang’s theory of emotional experience consisting of valence (pleasant-unpleasant) and arousal (calm-excited). The researchers hypothesize sensory pain experiences are not altered in BPD (or in individuals who utilize self-injury as a coping strategy for dysphoria) but rather pain response during self-injury is altered due to the high affective arousal and negative affective valence during that episode.

*Findings Regarding Emotional Arousal and Pain Response*

Klossika and colleagues (2006) elaborated on research demonstrating altered pain response in post-traumatic stress disorder, borderline personality disorder, major depression, eating disorders, and schizophrenia. Decreased pain sensitivity has been noted in all of these disorders, though the hypothesized altered pain components vary. In particular, findings have suggested affective components of pain alteration in PTSD, BPD, and major depression but not eating disorders and schizophrenia, where sensory and cognitive components to pain are implicated in altered pain response. However, this theory does not address experimental pain paradigms which measure pain response in the absence of emotional arousal.

There is support to the hypothesis that reduction of pain perception and sensation during experimental manipulations are likely mediated by reduced activation in the anterior cingulate cortex (Cardenas-Morales et al., 2011; Schmahl et al., 2006). For individuals with high levels of dysphoria and frequent acute negative emotion (e.g., those
with BPD) the anterior cingulate cortex (ACC) becomes more activated than in the average person, with a commensurate decrease in ACC activity following painful experiences, suggesting a negative reinforcement function as individuals feel relief from emotional components to pain.

In one such study, an experimental pain paradigm was employed to examine the affective component of pain in BPD patients who engaged in self-injury; repetitive peripheral magnetic stimulation was used to assess pain responses (Cardenas-Morales et al., 2011). Results showed BPD patients had a significantly higher pain threshold than controls and a correlation was found between higher pain threshold and self-reported intensity of negative emotion as a motivational factor for self-injury on a self-report measure of self-injury behaviors.

The finding of reduced pain sensitivity during acute aversive affective states (particularly affect with high arousal; Klossika et al., 2006) can be viewed as a physiological response, which in evolutionary terms is protective for the organism (e.g., reduced pain during events where the organism must choose fight-or-flight). The sensory component is theorized to involve a neural pathway projecting from the lateral thalamic nuclei to the somatosensory cortices while the affective component is theorized to involve a neural pathway projecting from the medial thalamic nuclei to the insula and cingulate cortex (Schmahl et al., 2006).

PET scans have also shown activation of the primary and secondary somatosensory cortex, anterior insula and anterior cingulate cortex in response to noxious heat stimuli (Gatchel, Peng, Peters, Fuchs, & Turk, 2007). As pain involves many components (e.g., sensory, affective, attentional), fMRI studies have been conducted to delineate which brain regions are activated by certain aspects of pain; for example,
anticipation of pain was associated with increased activity in the anterior ACC, while sensation of pain activated the posterior ACC (Gatchel et al., 2007).

Utilizing fMRI, Baliki and colleagues (2006) found individuals with chronic pain demonstrated increased activity in the medial prefrontal cortex (mPFC, including the rostral anterior cingulate), a region also associated with the experience of negative emotions. DeVane (2001) points to the role of substance P as part of the informative nature of emotion in motivating behavior. The natural release of substance P in turn stimulates the amygdala, which prompts a response to fear or anxiety through autonomic responses.

Using functional magnetic resonance imagery and painful heat stimuli, Schmahl and colleagues (2006) examined patients diagnosed with BPD (all with a positive history of NSSI) and healthy matched controls to determine neural correlates of pain processing. Results indicated BPD patients displayed a significant reduction in pain sensation and reduced activity in brain areas thought responsible for cognitive and emotional components of pain. It is important to note BPD patients had significantly lower activity in the anterior cingulate cortex (ACC) during the pain paradigm compared to controls, but no consideration was given to the role of affect (in particular, negative affect) prior to the pain paradigm.

Another fMRI examination conducted by Niedtfeld and colleagues (2010) found BPD participants (70% of whom reported no pain during self-injury) demonstrated increased activation of the ACC and amygdala when prompted for negative emotion compared to healthy controls. These researchers also replicated their previous findings where BPD patients demonstrated a higher pain threshold in response to an experimentally induced pain paradigm using heat during the fMRI.
Taken in conjunction, the results from the studies conducted by Schmahl and colleagues (2006) and Niedtfeld and colleagues (2010) paint a picture of NSSI as a way to modulate negative affect, with expected neurobiological changes. In the latter, ACC activation increased following negative mood induction (as expected), and in the former ACC activation decreased following physical pain. These findings may also explain why some individuals experience increases in positive affect, especially relief, following NSSI (Klonsky, 2009).

*Findings Regarding Emotional Valence and Pain Response*

Klonsky (2009) elaborated on the role of affective valence, arousal, and the combination of both in NSSI in a study of 39 undergraduates. When subjects were asked to recall their emotional experiences following self-injury, significant reductions in high arousal-negative affect states were found while, low arousal-positive affect states increased following the injury. Importantly, these findings lend support to multiple (and simultaneous) functions of self-injury rather than a singular function of NSSI. When viewed in the framework of affective valence and arousal, both negative and positive reinforcement are identified; with negative reinforcement serving a primary function in reducing negative affect, but also a secondary positive reinforcement function where positive affect is increased. In this way, altering affective valence (from negative to positive) is associated with initiation and maintenance of NSSI behaviors.

Another study which found increases in positive valence-low arousal affect (i.e., relief) following self-injury was conducted by Claes, Klonsky, Muehlenkamp, Kuppens, and Vandereycken (2010) using a sample of eating disordered inpatients. Building off the results of Klonsky (2009), Claes and colleagues (2010) found increases in positive affect in addition to reductions of negative affect. While non-significant, only increases in
positive affect following self-injury trended towards an association with frequency of NSSI per month, planning of NSSI, and the number of overall functions of self-injury that were reported.

Franklin and colleagues (2010) examined the pain response of undergraduate participants on the cold pressor task (CPT) following a negative mood induction and found no significant change in affective valence following the CPT. Participants were matched based on levels of affect dysregulation and either presence of NSSI within the past year or a history of no NSSI. No group demonstrated improved affect following the CPT; however, the authors note a restricted level of affect dysregulation in their undergraduate sample as compared to clinical samples.

Again using a non-clinical sample, a recent study examined the qualitative descriptors of college student’s feelings before, during and after self-injury (Kakhnovets, Young, Purnell, Huebner, & Bishop, 2010). A large number of participants described negative affect preceding self-injury, particularly feeling depressed, angry, stressed, isolated, and having low self-esteem. During self-injury, these negative feelings decreased and participants described beginning to feel low levels of positive affect including relief, numbness, and feeling high. Simultaneously, feelings of stress, isolation and low self-esteem became absent. Following self-injury, stress, isolation, and low self-esteem were still absent, feelings of relief, numbness, and being high remained. Perhaps most tellingly, participants reported feelings of shame were absent until after self-injury. In this way, self-injury functioned to decrease negative affect and increase positive feelings, but this was followed by feelings of shame which only served to maintain negative affect following the episode.
These findings are congruent with the dysregulated functioning of the ACC in BPD patients during negative mood induction as well as an experimental pain condition, where ACC activity increases as negative affect increases and decreases following manipulation of physical pain. Whether through physiologic examinations of neurobiological changes caused by mood changes and pain perception or through self-reported narratives of emotion and pain during self-injury, it is clear that negative affect plays a role in the experience of pain during self-injury. The current study sought to determine the role of dissociation as well as both positive and negative affect in pain during self-injury, as well as consider the interactions between them.

Hypotheses

The overall question of the current research was whether a history of NSSI is associated with altered response to experimentally induced pain experience, and if so, what role does dissociation and affect play in the way self-administered pain is experienced?

Hypothesis One

It was predicted that individuals with a recent history of NSSI (within the previous 12 months) would exhibit a higher pain threshold than individuals with a remote history (prior to the previous 12 months) of NSSI, who in turn were predicted to exhibit a higher pain threshold than those who have never engaged in NSSI.

Hypothesis Two

It was also predicted that individuals with a recent history of NSSI (within the previous 12 months) would exhibit a higher pain tolerance than individuals with a remote history (prior to the previous 12 months) of NSSI. These
individuals were predicted to exhibit a higher pain tolerance than those who have never engaged in NSSI.

*Hypothesis Three*

A number of variables were proposed to predict increased pain threshold, including low rates of pain catastrophizing, a history of NSSI behaviors, experience of painful and provocative life events, high rates of (pre-CPT) negative affect and dissociation, as well as higher rates of endorsed BPD Symptoms.

*Hypothesis Four*

A number of variables were proposed to predict increased pain tolerance, including low pain catastrophizing, high (pre-CPT) positive affect, low levels of dissociation, and a low frequency of painful and provocative life events experienced.

*Hypothesis Five*

Variables including high pain threshold, high pain tolerance, and low pain catastrophizing were expected to predict a decrease in negative affect between the first (pre-CPT) and second (post-CPT) administrations of the PANAS.

*Hypothesis Six*

Variables including a lower frequency of NSSI behaviors, low pain threshold, low pain tolerance, and high pain catastrophizing were expected to predict a decrease in positive affect between the first (pre-CPT) and second (post-CPT) administrations of the PANAS.

*Hypothesis Seven*

The three-way interaction between frequency of NSSI, dissociation and (pre-CPT) negative affect was expected to moderate the relation between pain threshold and lifetime frequency of self-injury, where high levels of dissociation and negative affect within the
context of higher frequency of self-injury were expected to predict higher pain threshold, while high dissociation and negative affect was not expected to predict higher pain threshold with a low frequency of self-injury.

_Hypothesis Eight_

The three-way interaction between frequency of NSSI, dissociation and (pre-CPT) negative affect was expected to moderate the relation between pain tolerance and lifetime frequency of self-injury, where high levels of dissociation and negative affect within the context of higher frequency of self-injury was expected to predict higher pain tolerance, while high dissociation and negative affect was not expected to predict higher pain tolerance with a low frequency of self-injury.
CHAPTER II
METHOD

Participants

Participants were sixty-nine students enrolled at a large public research university in southern Mississippi. Participants completed the study in exchange for credit towards a research requirement or for extra credit as well as the chance to win a gift card to a local retail outlet.

Participants were screened for a number of medical conditions as exclusionary criteria, including history of cardiovascular disorder, fainting or seizure, frostbite, current injuries on the hands or arms, and Raynaud’s phenomenon (von Baeyer, Piira, Chambers, Trapanotto, & Zeltzer, 2005). Individuals who reported taking antidepressant medication within two weeks of their participation, analgesic medication within twenty-four hours of their participation, use of illicit drugs or alcohol in the twenty-four hours prior to their participation, or use of nicotine or caffeine in the four hours prior to their participation were also excluded.

Design

This study utilized a quasi-experimental between groups design. Group assignment served as the independent variable with three conditions: positive history of NSSI within the previous 12 months, positive history of NSSI but not in the previous 12 months, and no history of lifetime use of NSSI.

Dependent variables included: pain threshold, operationally defined as the time from the onset of the cold pressor task until the participant reports the subjective experience of pain and pain tolerance, operationally defined as the time from the beginning of experience of pain until the participant discontinues the cold pressor task.
Negative affect as indicated by scores on the negative affect scale of the Positive and Negative Affect Scale (PANAS) and positive affect as indicative by scores on the positive affect scale of the PANAS were also included as dependent variables.

Measures

*Affective Intensity Measure* (AIM: Larsen & Dierner, 1987). The AIM is a 40-item self-report measure designed to assess strength and intensity of experienced emotion (see Appendix A). The AIM was included to consider the association between intensity of emotion and NSSI. Coefficient alpha in four samples ranged from .90 to .94, and test-retest reliability when assessed after a period of 1-, 2- or 3-months was found to range from .80 to .81. Cronbach’s alpha in the current sample was .90.

*Borderline Symptom List* (BSL; Bohus et al., 2007). The BSL is a 95-item self-report measure of symptoms of borderline personality disorder (see Appendix B) and was included because of the association between borderline personality traits and NSSI. It consists of a total score and 7 subscales; Self-perception (19 items), Affect regulation (13 items), Self-destruction (12 items), Dysphoria (10 items), Loneliness (12 items), Intrusions (11 items) and Hostility (6 items). Participants rate the degree to which items describe them on a 5-point Likert scale (from *not at all* to *very strong*). Cronbach’s alpha for the subscales ranged from 0.80 to 0.94 and Cronbach’s alpha for the total score was 0.97. Test-retest reliability following one week ranged from $r = 0.72$ to $r = 0.87$ for the subscales and $r = 0.84$ for the total scale score. The BSL discriminates significantly between BPD patients, healthy individuals and patients with Axis I disorders on all scales.
and total score, with BPD patients scoring significantly higher than both groups ($p < 0.001$ on all subscales).

In the current sample, Cronbach’s alpha for the BSL (total) was .98, with Cronbach’s alpha for subscales ranged from .83 (Hostility) to .95 (Self Perception).

*Center for Epidemiologic Studies-Depressed Mood Scale* (CES-D; Radloff, 1977). The CES-D is a 20-item scale designed to measure depression in the general population, specifically focusing on the affective component of depression (see Appendix C) and was included to examine the association between depression, pain, and NSSI. The CES-D correlates highly with other measures of depression and mood. It has good known-groups validity, and can discriminate between psychiatric inpatients and the general population. Internal consistency is reported to be good (Cronbach's alpha = .85). The CES-D has fair test-retest reliability, .51 - .67 over two to eight weeks (Fischer & Corcoran, 2007). In the current sample, Cronbach’s alpha was .90.

*Deliberate Self Harm Inventory* (DSHI; Gratz, 2001). The DSHI is a 17-item questionnaire designed to assess occurrence of non-suicidal self-injury as an act intended to cause tissue damage without intent to die (see Appendix D). Follow-up questions to each item determined history (how long ago the last behavior occurred and how often the behavior was engaged in), as well as if the injury was severe enough to necessitate hospitalization.

The final item is an open-ended question that simply asks if the individual has done any other self-injurious acts that were not specifically queried. Participants were reminded that a quantitative answer for frequency of self-injury and time since last self-injury was desired over a qualitative description.
This questionnaire was selected over other more general self-harm questionnaires because it specifically addresses behaviors that are intended to produce immediate physical consequence, such as tissue damage. It has high internal consistency (Cronbach's $\alpha = 0.82$). In the current sample, Cronbach’s alpha was .81.

Construct validity was determined by computing correlations between the DSHI and three other measures of self-injurious behaviors ($r$s ranging from .35 to .49). Discriminant validity of the DSHI was computed to determine whether the DSHI tapped into self-injurious behaviors and suicide attempts, which are typically seen as serving a different function. While the DSHI did predict suicide attempts ($r = .20$) it was a stronger predictor of self-injury. The DSHI has adequate test-retest reliability between two and four weeks, Spearman’s rho = .68.

Depressive Symptoms Inventory – Suicidality Subscale (DSI-SS; Metalsky & Joiner, 1997). The DSI-SS consists of 4 items that measure the frequency and intensity of suicidal thoughts and impulses in the preceding two weeks (Appendix E). Preliminary data support the scale’s internal consistency and validity (Joiner, Pfaff, & Acres, 2002). The DSI-SS was included in the current battery due to the association between NSSI thoughts and behaviors and suicidal thoughts and behaviors; further, it was included as a precautionary means to ensure the safety of participants who may have experienced suicidal ideation or intent prior to participation in the study. In the current study, Cronbach’s alpha was .88.

Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004). Emotional dysregulation is a core component of borderline personality disorder and has been associated with NSSI. The DERS is a 36-item measure devised to
assess the modulation of emotional arousal as well as awareness, understanding, acceptance of emotion, and acting with appropriate behavioral responses despite emotional state (see Appendix F). A six-factor solution was derived labeled nonacceptance (6 items), goals (5 items), impulse (6 items), acceptance (6 items), strategies (8 items), and clarity (5 items). The DERS was found to have high internal consistency (Cronbach’s alpha = .93), in the current study Cronbach’s alpha was .84 for the total scale, Cronbach’s alpha for the subscales ranged from .53 (Goals) to .86 (Awareness).

*Dissociative Experiences Scale* (DES; Bernstein & Putnam, 1986). The DES is a 28-item questionnaire designed to assess levels of dissociation in numerous situations, for each of which the participant is asked to indicate how often this happens to them on a scale of zero to one hundred in increments of ten (see Appendix G). Scores are averaged together, where higher scores indicate higher dissociation. Construct validity for the DES is fairly good, as it does not correlate with unrelated variables (socioeconomic status and gender), but does correlate significantly between overall score and differentiates diagnostic groups, ranging from a low score indicating "normal” levels of dissociation, and high scores predicting dissociative disorders.

Some researchers have examined the DES for factor structure (Stockdale, Gridley, Ware Balogh, & Holtgraves, 2002), but research on factor structure is not yet conclusive. The DES is internally consistent (Cronbach's $\alpha = 0.95$). With the current sample, Cronbach’s alpha was .93. Test-retest reliability over four to eight weeks is strong, $r = .84$ (Fischer & Corcoran, 2007).

*Pain Catastrophizing Scale* (PCS; Sullivan et al., 1995). The PCS consists of 13 statements which describe negative attributions associated with experiences of pain (see
Appendix H) and was included to examine the association between pain attitudes and response to painful stimuli. Participants are asked to rate their agreement with those statements on a 5-point Likert scale from 0, indicating not at all, to 5, indicating all the time. Test-retest reliability over 6 weeks was found to be $r = 0.75$ and internal consistency was high ($\alpha = 0.87$). With the current sample, Cronbach’s alpha was .95, with subscales ranging from .86 (Magnification) to .91 (Rumination).

_Painful and Provocative Events Scale_ (PPES; Bender, Gordon, & Joiner, 2011). The PPES is a self-report instrument designed to assess for the number of painful and provocative life events experienced, ranging from playing contact sports, getting a piercing, jumping from high places, to shooting a gun, tying a noose, or going sky diving (see Appendix I). Cronbach’s alpha for the scale in the current sample was .70.

_Pain Sensitivity Questionnaire_ (PSQ; Ruscheweyh, Marziniak, Stumppenhorst, Reinholz, & Knecht, 2009). The PSQ is a 17-item scale designed to assess for pain sensitivity based on painful situations that occur in daily life (Appendix J). Items group into two factors based on pain severity (minor and moderate). Test-retest reliability over 1 to 3 weeks ranged from 0.79 (PSQ-moderate) to 0.86 (PSQ-minor). The PSQ was found to correlate significantly with measures of pain catastrophizing and did not correlate significantly with measures of depression and anxiety. In the current sample, Cronbach’s alpha was .95.

_Positive and Negative Affect Scale – Expanded_ (PANAS-X; Watson & Clark, 1994). The PANAS-X is a 60-item scale designed to assess both positive
and negative affectivity (see Appendix K). Participants rate on a 5-point scale (1 - very slightly or not at all, 5 = extremely) the degree to which they have felt a particular way during the past few weeks, such as "cheerful", "afraid", and "enthusiastic". The scale can be scored in two ways: higher order scales and lower order scales. Higher order scales are broken down into positive affect and negative affect. Test-retest reliabilities (after two months) for positive affect ranged from .64 to .70, and .59 to .71 for negative affect. Lower order scales are: fear, hostility, guilt, sadness, shyness, fatigue, surprise, joviality, self-assurance, attentiveness, and serenity. Test-retest correlations for the lower order scales range from .51 to .70. This questionnaire will be administered both pre- and post-cold pressor task to assess for change in mood dependent on the experience of a painful stimuli. In the current sample, Cronbach’s alpha for the full scale was .83, Cronbach’s alpha for higher order scales were .65 (Negative Affect) and .84 (Positive Affect). Cronbach’s alphas for lower order scales ranged from .69 (Surprise) to .92 (Guilt).

Demographic Information. Demographic information was also collected, including gender, age, ethnicity, and relationship status (see Appendix L).

Procedure

Students were recruited from undergraduate psychology courses at the University of Southern Mississippi through an online research database (SONA). Participants were asked to complete self-report measures through online data collection (i.e., Qualtrics) to determine eligibility for the laboratory portion of the study. All participants provided informed consent prior to completing online questionnaires (see Appendix M). Responses from online measures indicated whether they had engaged in NSSI (both lifetime and within the previous year). In addition to those who had never engaged in self-injury, those who reported having engaged in NSSI in the past but not within the previous year
were considered to be unique from those who had engaged in NSSI in the previous year, as previous research indicates pain response in these individuals approaches baseline after discontinuing this behavior (Ludäscher et al., 2009).

Participants were also assessed for medication usage and conditions contraindicated with the use of the cold pressor task. Participants were excluded if they reported current use of antidepressant medications or analgesic medications (if they would be unable to abstain from use of analgesics for the twenty-four hours prior to their laboratory session). Medical conditions assessed included Raynaud’s phenomenon, current injury to the dominant hand, history of cardiovascular disorders, fainting or seizures, or a history of frostbite. Those individuals who did not endorse these exclusionary criteria were contacted and invited to participate in the experiment and scheduled for a laboratory session. All participants were asked to refrain from use of analgesics, alcohol or illicit substances for twenty-four hours prior to the laboratory session, as well as use of nicotine or caffeine in the four hours prior to the laboratory session. All participants provided informed consent prior to participating in the laboratory portion of the study (see Appendix N). Participants were administered the PANAS both before and after completing the cold pressor task to assess for change in positive and negative affect resulting from the experience of pain.

For the cold pressor task, a 25-quart plastic aquarium was filled with water maintained between 0-3°C by adding ice to cold water which was filtered through a fish-tank pump to keep the ice from making contact with the participant’s skin. Pain threshold and tolerance were timed with a stopwatch. Participants were asked to place their right hand into the water to the depth of the wrist and then to
note when discomfort was first felt (pain threshold) and when they could no longer tolerate pain and wished to remove their hand (pain tolerance). In this study, the right hand was chosen for the cold pressor task as Murray and Hagan (1973) reported greater sensitivity to pain in the left hand regardless which hand was noted to be dominant. The participants were instructed to say aloud “now” at the time of pain threshold and to remove their hand at the point of pain tolerance. In the event a participant had not removed their hand by 6 minutes after submersion they were instructed to remove their hand.

The cold pressor task is a widely used procedure for the experimental manipulation of pain without lasting bodily harm. Presently, it is difficult to closely replicate the sensations involved in NSSI, particularly as NSSI is not defined by a single behavior, but includes multiple forms (e.g., cutting, burning, and bruising).

Data Preparation and Hypothesis Testing Procedure

For all data, descriptive statistics were computed. Zero-order correlations were conducted between all self-reported psychopathology variables, self-reported pain experience variables, and objective responses on the cold pressor task. Additionally, a difference score was computed for both positive and negative affect between first (pre-CPT) and second (post-CPT) administrations of the PANAS.

Hypothesis One was examined using one-way analysis of variance. Following a significant omnibus indicating group differences on pain threshold, post hoc analysis using Tukey’s HSD was conducted to determine which pairwise comparisons were significant.

Hypothesis Two was examined using one-way analysis of variance. Following a significant omnibus indicating group differences on pain tolerance, post hoc analysis
using Tukey’s HSD was conducted to determine which pairwise comparisons were significant.

Hypothesis Three was examined using linear regression with variables significantly correlating with pain threshold (with magnitude of .350 or greater) as predictors of increased pain threshold. Hypothesis Four was examined similarly to hypothesis three, except the outcome variable was increased pain tolerance.

Hypothesis Five was examined using linear regression with variables significantly correlating with negative affect (with magnitude of .350 of greater) as predictors of a decrease between pre-CPT and post-CPT scores (utilizing change scores) on the negative affect subscale of the PANAS.

Hypothesis Six was examined similarly to hypothesis five, except the outcome variable was a decrease in pre-CPT and post-CPT scores (utilizing change scores) on the positive affect subscale of the PANAS.

Hypothesis Seven tested for a moderated relationship between increased pain threshold and total lifetime frequency of NSSI using a three-way interaction model testing the effect of the interaction between NSSI frequency, dissociation, and negative affect (utilizing PROCESS; Hayes, 2013).

Hypothesis Eight tested for a moderated relationship between increased pain tolerance and total lifetime frequency of NSSI using a three-way interaction model testing the effect of the interaction between NSSI frequency, dissociation, and negative affect (utilizing PROCESS; Hayes, 2013).
CHAPTER III

RESULTS

Descriptive Statistics

In the current study, females made up 75.4% of the sample, and mean age was 20.81. Ages ranged from 18 to 53, but 95.7% of the sample were between ages 18 and 26. Of the 69 participants, 36 (52.2%) identified as Caucasian, 31 (44.9%) identified as African American, and 3 (4.3%) identified as Asian.

The control group (no NSSI) was comprised of 38 participants (55.1% of the sample), mean age was 20.37 ($SD = 1.93$), 76.3% were female, 42.1% were Caucasian, and 52.6% were African American. Of those with a past history of NSSI ($n = 18$, 26.1% of the sample), mean age was 19.61 ($SD = 1.97$), 72.2% were female, 61.1% were Caucasian, and 11.1% were African American. Of those who had engaged in NSSI within the past 12 months ($n = 11$, 15.9% of the sample), mean age was 24.55 ($SD = 10.77$), 72.7% were female, 45.5% were Caucasian, and 54.5% were African American.

With regard to handedness, 61 (88.4%) reported being right-hand dominant, 6 (8.7%) reported being left-hand dominant, and 2 (2.9%) reported being ambidextrous. To rule out differences on the cold pressor task due to handedness, one-way ANOVAs were conducted based on handedness (between left hand dominant, right hand dominant, and ambidextrous individuals). Results showed no significant difference due to handedness on pain threshold, $F (2, 64) = .095, p = .910$, or pain tolerance, $F (2, 64) = .267, p = .766$.

Differences between past and current NSSI groups on DSHI variables were conducted. Results showed no significant difference in the number of NSSI methods endorsed, $t(27) = -1.247, p = .223$, frequency of NSSI, $t(26) = -1.038, p = .309$, or
duration NSSI was engaged in, \( t(27) = -1.052, p = .302 \). The current NSSI condition did report a later age of onset of NSSI, \( t(27) = -2.347, p = .027 \).

Time before reaching pain threshold ranged from 2.6 seconds to 114.94 seconds while time before subsequent pain tolerance ranged from an additional .55 seconds to 343.17 seconds. Only two participants reached the six minute time limit for the CPT before being instructed to remove their hands; one was from the past NSSI group, the other from the current NSSI group.

Means and standard deviations of clinical variables (pain threshold, pain tolerance, NSSI, affective intensity, borderline symptoms, depression, emotion dysregulation, dissociation, pain catastrophizing, pain sensitivity, painful and provocative life events, positive and negative affect) are presented in Tables 1 through 12.

Table 1

*Descriptive Statistics, Parent Scales*

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*Note.* NSSI = Non-suicidal self-injury; AIM = Affective Intensity Measure; CES-D = Center for Epidemiological Studies Depression Scale; DES = Dissociative Experiences Scale; DSHI = Deliberate Self Harm Inventory; PCS = Pain Catastrophizing Scale; DERS = Difficulties in Emotion Regulation Scale; BSL = Borderline Symptom List; PPLE = Painful and Provocative Events Scale; PSQ = Pain Sensitivity Questionnaire; DSI = Depressive Symptom Index – Suicidality Subscale.
Table 2

*Descriptive Statistics, Parent Scales (No-NSSI group)*

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*Note.* NSSI = Non-suicidal self-injury; AIM = Affective Intensity Measure; CES-D = Center for Epidemiological Studies Depression Scale; DES = Dissociative Experiences Scale; DSHI = Deliberate Self Harm Inventory; PCS = Pain Catastrophizing Scale; DERS = Difficulties in Emotion Regulation Scale; BSL = Borderline Symptom List; PPLE = Painful and Provocative Events Scale; PSQ = Pain Sensitivity Questionnaire; DSI = Depressive Symptom Index – Suicidality Subscale.

Table 3

*Descriptive Statistics, Parent Scales (Past-NSSI group)*

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*Note.* NSSI = Non-suicidal self-injury; AIM = Affective Intensity Measure; CES-D = Center for Epidemiological Studies Depression Scale; DES = Dissociative Experiences Scale; DSHI = Deliberate Self Harm Inventory; PCS = Pain Catastrophizing Scale; DERS = Difficulties in Emotion Regulation Scale; BSL = Borderline Symptom List; PPLE = Painful and Provocative Events Scale; PSQ = Pain Sensitivity Questionnaire; DSI = Depressive Symptom Index – Suicidality Subscale.
### Table 4

*Descriptive Statistics, Parent Scales (Current-NSSI group)*

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*Note.* NSSI = Non-suicidal self-injury; AIM = Affective Intensity Measure; CES-D = Center for Epidemiological Studies Depression Scale; DES = Dissociative Experiences Scale; DSHI = Deliberate Self Harm Inventory; PCS = Pain Catastrophizing Scale; DERS = Difficulties in Emotion Regulation Scale; BSL = Borderline Symptom List; PPLE = Painful and Provocative Events Scale; PSQ = Pain Sensitivity Questionnaire; DSI = Depressive Symptom Index – Suicidality Subscale.

### Table 5

*Descriptive Statistics, Subscales*

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*Note.* PCS = Pain Catastrophizing Scale; DERS = Difficulties in Emotion Regulation Scale; BSL = Borderline Symptom List; PSQ = Pain Sensitivity Questionnaire.
### Table 6

**Descriptive Statistics, Subscales (No-NSSI group)**

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*Note*: NSSI = Non-suicidal self-injury; PCS = Pain Catastrophizing Scale; DERS = Difficulties in Emotion Regulation Scale; BSL = Borderline Symptom List; PSQ = Pain Sensitivity Questionnaire.

### Table 7

**Descriptive Statistics, Subscales (Past-NSSI group)**

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*Note*: NSSI = Non-suicidal self-injury; PCS = Pain Catastrophizing Scale; DERS = Difficulties in Emotion Regulation Scale; BSL = Borderline Symptom List; PSQ = Pain Sensitivity Questionnaire.
Table 8

*Descriptive Statistics, Subscales (Current-NSSI group)*

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<td>BSL Hostility</td>
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*Note.* NSSI = Non-suicidal self-injury; PCS = Pain Catastrophizing Scale; DERS = Difficulties in Emotion Regulation Scale; BSL = Borderline Symptom List; PSQ = Pain Sensitivity Questionnaire.

Table 9

*Descriptive Statistics, Affect, and Pain Response*

<table>
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*Note.* CPT = Cold Pressor Task.
Table 10

*Descriptive Statistics, Affect, and Pain Response (No-NSSI group)*

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*Note.* NSSI = Non-suicidal self-injury; CPT = Cold Pressor Task.

Table 11

*Descriptive Statistics, Affect, and Pain Response (Past-NSSI group)*

<table>
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*Note.* NSSI = Non-suicidal self-injury; CPT = Cold Pressor Task.

Table 12

*Descriptive Statistics, Affect, and Pain Response (Current-NSSI group)*

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<tr>
<td>Pre-CPT Positive Affect</td>
<td>27.45</td>
<td>8.09</td>
<td>11</td>
</tr>
<tr>
<td>Post-CPT Negative Affect</td>
<td>14.36</td>
<td>7.10</td>
<td>11</td>
</tr>
<tr>
<td>Post-CPT Positive Affect</td>
<td>26.72</td>
<td>9.96</td>
<td>11</td>
</tr>
<tr>
<td>Negative Affect Change</td>
<td>7.64</td>
<td>6.98</td>
<td>11</td>
</tr>
<tr>
<td>Positive Affect Change</td>
<td>.73</td>
<td>4.96</td>
<td>11</td>
</tr>
<tr>
<td>Pain Threshold</td>
<td>34.06</td>
<td>38.37</td>
<td>11</td>
</tr>
<tr>
<td>Pain Tolerance</td>
<td>46.42</td>
<td>87.74</td>
<td>11</td>
</tr>
</tbody>
</table>

*Note.* NSSI = Non-suicidal self-injury; CPT = Cold Pressor Task.
Correlations

Correlations were conducted to determine which variables were most predictive of pain response as well as positive and negative affect both pre- and post-CPT. As noted above, variables that were significantly correlated with the intended dependent variables and had a magnitude of .250 or greater were included as predictors in hypotheses three through six. Correlations of relevant variables are presented in Tables 13 through 16.

Table 13

Correlations Between Pain Threshold, Pain Tolerance, and Psychological Variable Parent Scales

<table>
<thead>
<tr>
<th>Scale</th>
<th>Pain Threshold</th>
<th>Pain Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIM</td>
<td>-.136</td>
<td>.136</td>
</tr>
<tr>
<td>CES-D</td>
<td>.189</td>
<td>.227†</td>
</tr>
<tr>
<td>DES</td>
<td>.280*</td>
<td>.151</td>
</tr>
<tr>
<td>DSHI</td>
<td>.415</td>
<td>.057</td>
</tr>
<tr>
<td>PCS</td>
<td>.471**</td>
<td>.363**</td>
</tr>
<tr>
<td>DERS</td>
<td>.166</td>
<td>.192</td>
</tr>
<tr>
<td>BSL</td>
<td>.382*</td>
<td>.427**</td>
</tr>
<tr>
<td>PPLE</td>
<td>.016</td>
<td>.035</td>
</tr>
<tr>
<td>PSQ</td>
<td>-.128</td>
<td>.011</td>
</tr>
<tr>
<td>DSI</td>
<td>.184</td>
<td>.222†</td>
</tr>
</tbody>
</table>

Note. AIM = Affective Intensity Measure; CES-D = Center for Epidemiological Studies Depression Scale; DES = Dissociative Experiences Scale; DSHI = Deliberate Self Harm Inventory; PCS = Pain Catastrophizing Scale; DERS = Difficulties in Emotion Regulation Scale; BSL = Borderline Symptom List; PPLE = Painful and Provocative Events Scale; PSQ = Pain Sensitivity Questionnaire; DSI = Depressive Symptom Index – Suicidality Subscale; Change NA = increase in Negative Affect; Change PA = increase in Positive Affect; †p < .10, ‡p < .05, *p < .01.
Table 14

**Correlations Between Pain Threshold, Pain Tolerance, and Psychological Variable Subscales**

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Pain Threshold</th>
<th>Pain Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCS Rumination</td>
<td>.410**</td>
<td>.325**</td>
</tr>
<tr>
<td>PCS Magnification</td>
<td>.408**</td>
<td>.438**</td>
</tr>
<tr>
<td>PCS Helplessness</td>
<td>.424**</td>
<td>.271*</td>
</tr>
<tr>
<td>DERS Nonacceptance</td>
<td>.091</td>
<td>.204†</td>
</tr>
<tr>
<td>DERS Goals</td>
<td>.055</td>
<td>.031</td>
</tr>
<tr>
<td>DERS Impulse</td>
<td>.072</td>
<td>.203</td>
</tr>
<tr>
<td>DERS Awareness</td>
<td>-.024</td>
<td>-.121</td>
</tr>
<tr>
<td>DERS Strategies</td>
<td>.121</td>
<td>.225†</td>
</tr>
<tr>
<td>DERS Clarity</td>
<td>.187</td>
<td>.099</td>
</tr>
<tr>
<td>BSL Self Perception</td>
<td>.238†</td>
<td>.252†</td>
</tr>
<tr>
<td>BSL Affect Regulation</td>
<td>.152</td>
<td>.235</td>
</tr>
<tr>
<td>BSL Self Destruction</td>
<td>.257†</td>
<td>.359**</td>
</tr>
<tr>
<td>BSL Loneliness</td>
<td>.253†</td>
<td>.301*</td>
</tr>
<tr>
<td>BSL Hostility</td>
<td>.185</td>
<td>.136</td>
</tr>
<tr>
<td>BSL Intrusion</td>
<td>.359**</td>
<td>.252†</td>
</tr>
<tr>
<td>BSL Dysphoria</td>
<td>.051</td>
<td>.216</td>
</tr>
<tr>
<td>PSQ Minor</td>
<td>-.177</td>
<td>.012</td>
</tr>
</tbody>
</table>

*Note.* DERS = Difficulties in Emotion Regulation Scale; BSL = Borderline Symptom List; PSQ = Pain Sensitivity Questionnaire; ‡ p < .01, *p < .05, † p < .10.

Table 15

**Correlations Between PANAS Change Scores (Pre- and Post-CPT) and Psychological Variable Parent Scales**

<table>
<thead>
<tr>
<th>Scale</th>
<th>Change NA</th>
<th>Change PA</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIM</td>
<td>.152</td>
<td>.156</td>
</tr>
<tr>
<td>CES-D</td>
<td>.157</td>
<td>.136</td>
</tr>
<tr>
<td>DES</td>
<td>.301†</td>
<td>.122</td>
</tr>
<tr>
<td>DSHI</td>
<td>.041</td>
<td>.054</td>
</tr>
<tr>
<td>PCS</td>
<td>.265**</td>
<td>.178</td>
</tr>
<tr>
<td>DERS</td>
<td>.063</td>
<td>.096</td>
</tr>
<tr>
<td>BSL</td>
<td>.195</td>
<td>.100</td>
</tr>
<tr>
<td>PPLE</td>
<td>.166</td>
<td>-.178</td>
</tr>
<tr>
<td>PSQ</td>
<td>.158</td>
<td>-.051</td>
</tr>
<tr>
<td>DSI</td>
<td>.107</td>
<td>.059</td>
</tr>
</tbody>
</table>

*Note.* AIM = Affective Intensity Measure; CES-D = Center for Epidemiological Studies Depression Scale; DES = Dissociative Experiences Scale; DSHI = Deliberate Self Harm Inventory; PCS = Pain Catastrophizing Scale; DERS = Difficulties in Emotion Regulation Scale; BSL = Borderline Symptom List; PPLE = Painful and Provocative Events Scale; PSQ = Pain Sensitivity Questionnaire; DSI = Depressive Symptom Index – Suicidality Subscale; Change NA = increase in Negative Affect; Change PA = increase in Positive Affect; ‡ p < .01, *p < .05, † p < .10.
### Table 16

*Correlations Between Pre- and Post- CPT Affect and Psychological Variable Subscales*

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Change NA</th>
<th>Change PA</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCS Rumination</td>
<td>.126</td>
<td>.100</td>
</tr>
<tr>
<td>PCS Magnification</td>
<td>.341**</td>
<td>.290**</td>
</tr>
<tr>
<td>PCS Helplessness</td>
<td>.301**</td>
<td>.211†</td>
</tr>
<tr>
<td>DERS Nonacceptance</td>
<td>.193</td>
<td>.256*</td>
</tr>
<tr>
<td>DERS Goals</td>
<td>.056</td>
<td>.083</td>
</tr>
<tr>
<td>DERS Impulse</td>
<td>.121</td>
<td>.073</td>
</tr>
<tr>
<td>DERS Awareness</td>
<td>.029</td>
<td>-.223†</td>
</tr>
<tr>
<td>DERS Strategies</td>
<td>.116</td>
<td>.218†</td>
</tr>
<tr>
<td>DERS Clarity</td>
<td>.286*</td>
<td>-.037</td>
</tr>
<tr>
<td>BSL Self Perception</td>
<td>.281*</td>
<td>.168</td>
</tr>
<tr>
<td>BSL Affect Regulation</td>
<td>.141</td>
<td>.122</td>
</tr>
<tr>
<td>BSL Self Destruction</td>
<td>.118</td>
<td>.090</td>
</tr>
<tr>
<td>BSL Loneliness</td>
<td>.101</td>
<td>.176</td>
</tr>
<tr>
<td>BSL Hostility</td>
<td>.187</td>
<td>.038</td>
</tr>
<tr>
<td>BSL Intrusion</td>
<td>.357**</td>
<td>.142</td>
</tr>
<tr>
<td>BSL Dysphoria</td>
<td>.022</td>
<td>.232†</td>
</tr>
<tr>
<td>PSQ Minor</td>
<td>.170</td>
<td>.002</td>
</tr>
</tbody>
</table>

*Note.* PCS = Pain Catastrophizing Scale; DERS = Difficulties in Emotion Regulation Scale; BSL = Borderline Symptom List; PSQ = Pain Sensitivity Questionnaire; CPT = Cold Pressor Task; Change NA = increase in Negative Affect; Change PA = increase in Positive Affect; **p < .01, *p < .05, †p < .10.

### Tests of Hypotheses

**Hypothesis One**

All hypotheses were tested using SPSS Version 17.0. A one-way ANOVA was calculated to test Hypothesis One with pain threshold as the dependent variable and NSSI group (no history of NSSI, past but not current NSSI, current NSSI) as the independent variable. There was a significant effect of NSSI group, $F (2, 64) = 3.254, p = .045$.

Tukey’s HSD post-hoc analyses revealed that the current NSSI group obtained times that were significantly higher than the other two groups at $p = .036$ ($p = .041$ after Bonferroni correction), which did not differ from each other.
Hypothesis Two

A one-way ANOVA was calculated to test Hypothesis Two with pain tolerance as the dependent variable and NSSI group as the independent variable. There was a significant effect of NSSI group, $F(2, 64) = 3.249, p = .045$. Tukey’s HSD post-hoc analyses revealed that the past NSSI group obtained times that were significantly higher than the other two groups at $p = .046$ (however, this became non-significant following Bonferroni correction with $p = .054$), the two remaining groups did not differ.

Hypothesis Three

Predictors of increased pain threshold were evaluated using linear regression. Variables which significantly correlated with pain threshold (with magnitude of .350 or greater) were examined in the regression. A preliminary regression was conducted utilizing only parent scales with significant and meaningful correlates, in this case the PCS and BSL. Of this initial regression, the final model accounted for 43.1% of the variance in pain threshold, $F(2, 28) = 10.583, p < .001, f^2 = .757$ (see Table 17). In this model, pain catastrophizing was a significant predictor of increased pain threshold ($p = .001, \beta = .552$).

Table 17

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Std. Error</th>
<th>$\beta$</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>7.425</td>
<td>5.233</td>
<td>1.419</td>
<td>.167</td>
<td></td>
</tr>
<tr>
<td>PCS</td>
<td>1.474</td>
<td>.415</td>
<td>.552</td>
<td>3.552</td>
<td>.001&quot;</td>
</tr>
<tr>
<td>BSL</td>
<td>6.174</td>
<td>4.869</td>
<td>.197</td>
<td>1.268</td>
<td>.215</td>
</tr>
</tbody>
</table>

Note: $R^2 = .431, F(2, 28) = 10.583, p < .001, f^2 = .757$; PCS = Pain Catastrophizing Scale; BSL = Borderline Symptom List; " $p < .01$, † $p < .05$, * $p < .10$.

To determine whether specific subscales showed predictive value beyond the scale as a whole, a second regression was conducted entering subscales with significant
and meaningful correlates, in this case all PCS subscales and the BSL Intrusion factor.

This model accounted for 32.9% of the variance in pain threshold, $F(4, 51) = 6.259, p < .001, f^2 = .490$ (see Table 18). Notably, there were no individually significant predictors, though two subscales trended towards significance, namely the Helplessness factor of the Pain Catastrophizing Scale ($p = .066, \beta = .428$) and the Intrusion factor of the Borderline Symptom List ($p = .061, \beta = .242$).

Table 18

Subscale Predictors of Increased Pain Threshold (With Significant Correlates of .350 Magnitude or Greater)

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Std. Error</th>
<th>$\beta$</th>
<th>$t$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>12.801</td>
<td>2.917</td>
<td>.4388</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>PCS Rumination</td>
<td>-.005</td>
<td>1.562</td>
<td>-.001</td>
<td>-.003</td>
<td>.997</td>
</tr>
<tr>
<td>PCS Magnification</td>
<td>.208</td>
<td>1.589</td>
<td>-.035</td>
<td>.168</td>
<td>.867</td>
</tr>
<tr>
<td>PCS Helplessness</td>
<td>2.075</td>
<td>1.105</td>
<td>.428</td>
<td>1.878</td>
<td>.066†</td>
</tr>
<tr>
<td>BSL Intrusion</td>
<td>7.991</td>
<td>4.175</td>
<td>.242</td>
<td>1.914</td>
<td>.061†</td>
</tr>
</tbody>
</table>

Note. $R^2 = .329, F(4, 51) = 6.259, p < .001, f^2 = .490$; PCS = Pain Catastrophizing Scale; BSL = Borderline Symptom List; †$p < .01,$ *$p < .05,$ ‡$p < .10.$

A third regression was conducted utilizing parent scales with significant and meaningful correlates at the more lenient magnitude of .250, which added the DES to the overall model. The final model accounted for 44.2% of the variance in pain threshold, $F(3, 22) = 5.802, p = .004, f^2 = .792$ (see Table 19). In this model, pain catastrophizing remained the only significant predictor of increased pain threshold, $p = .008, \beta = .601$.

Table 19

Parent Scale Predictors of Increased Pain Threshold (With Significant Correlates of .250 Magnitude or Greater)

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Std. Error</th>
<th>$\beta$</th>
<th>$t$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>9.701</td>
<td>7.539</td>
<td>.127</td>
<td>.212</td>
<td></td>
</tr>
<tr>
<td>DES</td>
<td>-.197</td>
<td>.356</td>
<td>-.133</td>
<td>-553</td>
<td>.586</td>
</tr>
<tr>
<td>PCS</td>
<td>1.653</td>
<td>.562</td>
<td>.601</td>
<td>2.944</td>
<td>.008**</td>
</tr>
<tr>
<td>BSL</td>
<td>6.174</td>
<td>4.869</td>
<td>.197</td>
<td>1.268</td>
<td>.215</td>
</tr>
</tbody>
</table>

Note. $R^2 = .442, F(3, 22) = 5.802, p = .004, f^2 = .792$; DES = Dissociative Experiences Scale; PCS = Pain Catastrophizing Scale; BSL = Borderline Symptom List; †$p < .01,$ *$p < .05,$ ‡$p < .10.$
A fourth regression was conducted utilizing subscales with significant and meaningful correlates at the more lenient magnitude of .250, which added the BSL Self Destruction and Loneliness subscales to the final model. This model accounted for 44.2% of the variance in pain threshold, $F(6, 37) = 4.893, p = .001, f^2 = .792$ (see Table 20).

Notably, the PCS Helplessness subscale became a significant predictor in this model ($p = .026, \beta = .484$).

Table 20

**Subscale Predictors of Increased Pain Threshold (With Significant Correlates of .250 Magnitude or Greater)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Std. Error</th>
<th>$\beta$</th>
<th>$t$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>10.115</td>
<td>3.783</td>
<td></td>
<td>2.674</td>
<td>.011</td>
</tr>
<tr>
<td>PCS Rumination</td>
<td>2.648</td>
<td>2.252</td>
<td>.369</td>
<td>1.176</td>
<td>.247</td>
</tr>
<tr>
<td>PCS Magnification</td>
<td>-3.825</td>
<td>2.711</td>
<td>-.406</td>
<td>-1.411</td>
<td>.167</td>
</tr>
<tr>
<td>PCS Helplessness</td>
<td>2.680</td>
<td>1.158</td>
<td>.484</td>
<td>2.315</td>
<td>.026*</td>
</tr>
<tr>
<td>BSL Self Destruction</td>
<td>1.155</td>
<td>6.289</td>
<td>.044</td>
<td>.184</td>
<td>.855</td>
</tr>
<tr>
<td>BSL Loneliness</td>
<td>-2.460</td>
<td>5.932</td>
<td>-.096</td>
<td>-.415</td>
<td>.681</td>
</tr>
<tr>
<td>BSL Intrusion</td>
<td>11.242</td>
<td>6.247</td>
<td>.352</td>
<td>1.800</td>
<td>.080†</td>
</tr>
</tbody>
</table>

Note: $R^2 = .442, F(6, 37) = 4.893, p = .001, f^2 = .792$; PCS = Pain Catastrophizing Scale; BSL = Borderline Symptom List; * $p < .01$, † $p < .05$, ‡ $p < .10$.

**Hypothesis Four**

Possible predictors of increased pain tolerance were evaluated using linear regression. Variables which significantly correlated with pain tolerance (with magnitude of .350 or greater) were examined in the regression. A preliminary regression was conducted utilizing parent scales with significant and meaningful correlates, namely the PCS and BSL (of import, these were also the only parent scales with significant correlates at a magnitude of .250 or greater). Of this initial regression, the final model accounted for 26.4% of the variance in pain tolerance, $F(2, 28) = 5.025, p = .014, f^2 = .358$ (see Table 21). In this model, no individual predictor reached significance, though pain catastrophizing trended towards significance ($p = .080, \beta = .321$).
Table 21

*Parent Scale Predictors of Increased Pain Tolerance (With Significant Correlates of .250 Magnitude or Greater)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Std. Error</th>
<th>β</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-.875</td>
<td>12.895</td>
<td>-.068</td>
<td>1.558</td>
<td>.155</td>
</tr>
<tr>
<td>PCS</td>
<td>1.856</td>
<td>1.022</td>
<td>.321</td>
<td>1.815</td>
<td>.080*</td>
</tr>
<tr>
<td>BSL</td>
<td>19.940</td>
<td>11.996</td>
<td>.294</td>
<td>1.662</td>
<td>.108</td>
</tr>
</tbody>
</table>

Note. $R^2 = .264$, $F(2, 28) = 5.025$, $p = .014$, $f^2 = .358$; PCS = Pain Catastrophizing Scale; BSL = Borderline Symptom List; *$p < .01$.

'p < .05, 'p < .10.

Again, a second regression was conducted to determine the predictive value of relevant subscales, included were the PCS Magnification subscale and the BSL Self Destruction subscale (subscales which were significant and correlated at a magnitude of .350 or greater). This second model accounted for 20.6% of the variance in pain tolerance, $F(2, 52) = 6.760$, $p = .002$, $f^2 = .259$ (see Table 22). Both emerged as individual significant predictors; notably the Magnification factor of the Pain Catastrophizing Scale ($p = .034$, $\beta = .280$) and the Self-Destructiveness factor of the Borderline Symptom List ($p = .030$, $\beta = .287$).

Table 22

*Subscale Predictors of Increased Pain Tolerance (With Significant Correlates of .350 Magnitude or Greater)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Std. Error</th>
<th>β</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>9.082</td>
<td>6.299</td>
<td>1.442</td>
<td>.155</td>
<td></td>
</tr>
<tr>
<td>PCS Magnification</td>
<td>5.423</td>
<td>2.489</td>
<td>.280</td>
<td>2.179</td>
<td>.034*</td>
</tr>
<tr>
<td>BSL Self Destruction</td>
<td>15.653</td>
<td>7.015</td>
<td>.287</td>
<td>2.231</td>
<td>.030*</td>
</tr>
</tbody>
</table>

Note. $R^2 = .206$, $F(2, 52) = 6.760$, $p = .002$, $f^2 = .259$; PCS = Pain Catastrophizing Scale; BSL = Borderline Symptom List; *$p < .01$.

'p < .05, 'p < .10.

A third regression was conducted utilizing subscales with significant and meaningful correlates at the more lenient magnitude of .250, which added the PCS Helplessness and Rumination subscales, as well as the BSL Self Perception, Loneliness, and Intrusion subscales. This model accounted for 36% of the variance in pain tolerance.
As in the previous model, there were no individual significant predictors; however, in this more lenient model no individual subscale trended towards significance.

Table 23

Subscale Predictors of Increased Pain Tolerance (With Significant Correlates of .250 Magnitude or Greater)

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Std. Error</th>
<th>β</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>8.074</td>
<td>11.155</td>
<td>.724</td>
<td>.475</td>
<td></td>
</tr>
<tr>
<td>PCS Rumination</td>
<td>.888</td>
<td>5.758</td>
<td>.057</td>
<td>.154</td>
<td>.878</td>
</tr>
<tr>
<td>PCS Magnification</td>
<td>3.518</td>
<td>6.910</td>
<td>.172</td>
<td>.509</td>
<td>.614</td>
</tr>
<tr>
<td>PCS Helplessness</td>
<td>1.245</td>
<td>3.044</td>
<td>.104</td>
<td>.409</td>
<td>.686</td>
</tr>
<tr>
<td>BSL Loneliness</td>
<td>-7.559</td>
<td>24.852</td>
<td>-.659</td>
<td>1.511</td>
<td>.141</td>
</tr>
<tr>
<td>BSL Intrusion</td>
<td>7.204</td>
<td>22.739</td>
<td>.098</td>
<td>.317</td>
<td>.754</td>
</tr>
<tr>
<td>BSL Self Perception</td>
<td>31.478</td>
<td>38.909</td>
<td>.503</td>
<td>.809</td>
<td>.425</td>
</tr>
<tr>
<td>BSL Self Destruction</td>
<td>23.508</td>
<td>18.281</td>
<td>.392</td>
<td>1.286</td>
<td>.208</td>
</tr>
</tbody>
</table>

Note. $R^2 = .360$, $F(7, 30) = 2.413, p = .044, f^2 = .562$; PCS = Pain Catastrophizing Scale; BSL = Borderline Symptom List; $^\dagger p < .10$.

Hypothesis Five

Possible predictors of the decrease from pre- to post-cold pressor task scores on the negative affect subscale of the PANAS were evaluated using linear regression. Variables that significantly correlated with reduction of PANAS negative affect (with magnitude of .250 or greater in this case, as there were no variables with correlations reaching a magnitude of .350) were examined in the regression. An initial regression was conducted utilizing parent scales with significant and meaningful correlates, in this case the PCS and DES. This first model predicted 11.9% of the variance of the decrease in negative affect and was slightly greater than significant, $F(2, 47) = 3.181, p = .051, f^2 = .135$ (see Table 24), with dissociation trending towards significance as a predictor ($p = .074, \beta = .289$).
Table 24

*Parent Scale Predictors of Decreased Negative Affect (With Significant Correlates of .250 Magnitude or Greater)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Std. Error</th>
<th>β</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>.875</td>
<td>1.431</td>
<td>.621</td>
<td>.544</td>
<td>.544</td>
</tr>
<tr>
<td>DES</td>
<td>.131</td>
<td>.071</td>
<td>.289</td>
<td>1.830</td>
<td>.074†</td>
</tr>
<tr>
<td>PCS</td>
<td>.056</td>
<td>.094</td>
<td>.094</td>
<td>.595</td>
<td>.554</td>
</tr>
</tbody>
</table>

Note. $R^2 = .119$, $F (2, 47) = 3.181, p = .051, f^2 = .135$; DES = Dissociative Experiences Scale; PCS = Pain Catastrophizing Scale; † $p < .10$.

Again, to determine the predictive value of relevant subscales, a second regression was conducted utilizing variables with a significant and meaningful correlation (with a magnitude of .350 or greater), in this case only the BSL Intrusion subscale met this criteria. This model accounted for 12.7% of the variance in negative affect change scores, $F (1, 54) = 7.863, p = .007, f^2 = .145$ (see Table 25). The Intrusion factor of the Borderline Symptom List was significant as a predictor ($p = .007, \beta = .357$).

Table 25

*Subscale Predictors of Decreased Negative Affect (With Significant Correlates of .350 Magnitude or Greater)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Std. Error</th>
<th>β</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>1.826</td>
<td>.921</td>
<td></td>
<td>2.003</td>
<td>.050</td>
</tr>
<tr>
<td>BSL Intrusion</td>
<td>3.571</td>
<td>1.274</td>
<td>.357</td>
<td>2.804</td>
<td>.007*</td>
</tr>
</tbody>
</table>

Note. $R^2 = .127$, $F (1, 54) = 7.863, p = .007, f^2 = .135$; BSL = Borderline Symptom List; * $p < .01$, † $p < .05$, ‡ $p < .10$.

A third regression was conducted utilizing subscales with significant and meaningful correlates at the more lenient magnitude of .250, which added the PCS Magnification and Helplessness subscales, the DERS Clarity subscale, and the BSL Self-Perception subscale to the final model. This model accounted for 27.2% of the variance in negative affect change scores, $F (5, 41) = 3.057, p = .020, f^2 = .373$ (see Table 26). In this instance, only the Intrusion factor of the Borderline Symptom List remained significant ($p = .033, \beta = .534$).
Table 26

Subscale Predictors of Decreased Negative Affect (With Significant Correlates of .250 Magnitude or Greater)

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Std. Error</th>
<th>β</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-4.997</td>
<td>6.707</td>
<td>-.745</td>
<td>.460</td>
<td></td>
</tr>
<tr>
<td>PCS Magnification</td>
<td>.473</td>
<td>.488</td>
<td>.205</td>
<td>.969</td>
<td>.338</td>
</tr>
<tr>
<td>PCS Helplessness</td>
<td>.069</td>
<td>.299</td>
<td>.047</td>
<td>.230</td>
<td>.819</td>
</tr>
<tr>
<td>BSL Intrusion</td>
<td>5.751</td>
<td>2.602</td>
<td>.534</td>
<td>2.210</td>
<td>.033*</td>
</tr>
<tr>
<td>BSL Self Perception</td>
<td>-3.061</td>
<td>2.129</td>
<td>-.342</td>
<td>-1.438</td>
<td>.158</td>
</tr>
<tr>
<td>DERS Clarity</td>
<td>13.432</td>
<td>13.564</td>
<td>.151</td>
<td>.990</td>
<td>.328</td>
</tr>
</tbody>
</table>

Note. R² = .272, F (5, 41) = 3.057, p = .020, f² = .373; PCS = Pain Catastrophizing Scale; BSL = Borderline Symptom List; DERS = Difficulties in Emotion Regulation Scale; * p < .01, † p < .05, ‡ p < .10.

Hypothesis Six

Possible predictors of the decrease in pre- to post-cold pressor task scores on the positive affect subscale of the PANAS were evaluated using linear regression. Variables which significantly correlated with PANAS positive affect change scores (with magnitude of .350 or greater) were examined in the regression. In contrast to the previous hypotheses, a regression was not conducted with the utilization of parent scales in predicting change in positive affect following the CPT, as no parent scale was found to be a significant correlate even with the less stringent magnitude of .250. However, a regression was conducted to examine the predictive value of subscales which significantly correlated with change in positive affect with a magnitude of .250 or greater (as, again, no subscale correlated with a magnitude of .350 or greater), in this instance the PCS Magnification subscale and the DERS Nonacceptance subscale were included. The final model accounted for 10.5% of the variance in positive affect change scores, F (2, 58) = 3.413, p = .040, f² = .117 (see Table 27). Again, no individual variable was a significant predictor though the Magnification factor of the Pain Catastrophizing Scale approached significance (p = .065, β = .244).
Table 27

Subscale Predictors of Decreased Positive Affect (With Significant Correlates of .250 Magnitude or Greater)

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Std. Error</th>
<th>β</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-0.472</td>
<td>1.650</td>
<td>-0.286</td>
<td>1.878</td>
<td>.065†</td>
</tr>
<tr>
<td>PCS Magnification</td>
<td>0.552</td>
<td>0.294</td>
<td>0.244</td>
<td>1.171</td>
<td>.246</td>
</tr>
<tr>
<td>DERS Nonacceptance</td>
<td>4.618</td>
<td>3.943</td>
<td>0.152</td>
<td>0.621</td>
<td>.528</td>
</tr>
</tbody>
</table>

Note. \( R^2 = .105, F(2, 58) = 3.413, p = .040, \eta^2 = .117 \); PCS = Pain Catastrophizing Scale; DERS = Difficulties in Emotion Regulation Scale; †p < .10.

Hypothesis Seven

A final moderated multiple regression was conducted utilizing PROCESS (Hayes, 2013) to test the three-way interaction among frequency of NSSI, dissociation (DES mean score), and negative affect (as measured by pre-CPT PANAS negative affect scores) on pain threshold. Notably, PROCESS automatically centers all variables prior to analysis. Main effects and all interactions were analyzed using the appropriate model for a three-way interaction (Model 3). The overall model was significant, \( F(7, 48) = 3.8943, R^2 = .3622, p = .0020, \eta^2 = .5625 \). The three-way interaction among NSSI frequency, dissociation, and negative affect on pain threshold was also significant, \( F(1, 48) = 11.6173, R^2_A = .1544, p = .0013, \eta^2_A = .1825 \) (see Table 28).

Table 28

Proposed Moderation of Dissociation and Pre-CPT Negative Affect Between NSSI Frequency and Pain Threshold

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Std. Error</th>
<th>t</th>
<th>p</th>
<th>LLCI</th>
<th>ULCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>27.750</td>
<td>17.269</td>
<td>1.604</td>
<td>.115</td>
<td>-7.017</td>
<td>64.427</td>
</tr>
<tr>
<td>NSSI</td>
<td>4.860</td>
<td>1.475</td>
<td>3.294</td>
<td>.001</td>
<td>1.894</td>
<td>7.827</td>
</tr>
<tr>
<td>DES</td>
<td>-0.291</td>
<td>0.730</td>
<td>-0.398</td>
<td>.621</td>
<td>-1.759</td>
<td>1.177</td>
</tr>
<tr>
<td>NSSIxDES</td>
<td>-0.211</td>
<td>0.061</td>
<td>-3.428</td>
<td>.001</td>
<td>-0.336</td>
<td>-0.087</td>
</tr>
<tr>
<td>NA</td>
<td>-0.743</td>
<td>1.024</td>
<td>-0.726</td>
<td>.471</td>
<td>-2.803</td>
<td>1.315</td>
</tr>
<tr>
<td>NSSIxNA</td>
<td>-0.213</td>
<td>0.068</td>
<td>-3.202</td>
<td>.002</td>
<td>-0.357</td>
<td>-0.081</td>
</tr>
<tr>
<td>DESxNA</td>
<td>0.033</td>
<td>0.040</td>
<td>0.819</td>
<td>.416</td>
<td>-0.048</td>
<td>0.115</td>
</tr>
<tr>
<td>NSSIxDESxNA</td>
<td>0.010</td>
<td>0.003</td>
<td>3.408</td>
<td>.001</td>
<td>0.004</td>
<td>0.016</td>
</tr>
</tbody>
</table>

Note. \( R^2 = .3622, F(7, 48) = 3.8943, p = .0020, \eta^2 = .5625 \); NSSI = Non-suicidal self-injury; DES = dissociation; NA = Negative Affect; LLCI = Lower Limit Confidence Interval; ULCI = Upper Limit Confidence Level; †p < .01, *p < .05, †p <.10.
Further analysis demonstrated at low levels of negative affect, as dissociation decreases, the influence of NSSI frequency on pain threshold increases. However, at low levels of negative affect and high levels of dissociation, NSSI frequency is negatively associated with pain threshold.

Additionally, at medium levels of negative affect, as dissociation decreases the influence of NSSI frequency on pain threshold increases, but NSSI frequency is only significant at low and medium levels of dissociation.

Lastly, only at high levels of negative affect and high dissociation is the influence of NSSI frequency a significant and positive predictor (see Table 29).

Table 29

<table>
<thead>
<tr>
<th>NA</th>
<th>Effect</th>
<th>Std. Error</th>
<th>t</th>
<th>p</th>
<th>LLCI</th>
<th>ULCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.616</td>
<td>-.084</td>
<td>.026</td>
<td>-3.253</td>
<td>.002**</td>
<td>-.137</td>
<td>-.032</td>
</tr>
<tr>
<td>18.714</td>
<td>-.023</td>
<td>.012</td>
<td>-1.859</td>
<td>.069</td>
<td>-.048</td>
<td>.001</td>
</tr>
<tr>
<td>24.812</td>
<td>.037</td>
<td>.016</td>
<td>2.238</td>
<td>.029*</td>
<td>.003</td>
<td>.072</td>
</tr>
</tbody>
</table>

*Note: NA = Negative Affect; LLCI = Lower Limit Confidence Interval; ULCI = Upper Limit Confidence Interval; **p < .01, *p < .05, †p < .10.*

**Hypothesis Eight**

A final moderated multiple regression was conducted utilizing PROCESS (Hayes, 2013) to test the interaction among frequency of NSSI, dissociation, and negative affect on pain tolerance. Again, PROCESS automatically centered all variables prior to analysis. Main effects and all interactions were analyzed using the appropriate model for a three-way interaction (Model 3). The overall model was not significant, F (7, 48) = .8404, $R^2 = .1092$, $p = .5596$ (see Table 30).
Table 30

Proposed Moderation of Dissociation and Pre-CPT Negative Affect Between NSSI Frequency and Pain Tolerance

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Std. Error</th>
<th>t</th>
<th>p</th>
<th>LLCI</th>
<th>ULCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-14.260</td>
<td>68.580</td>
<td>-.207</td>
<td>.836</td>
<td>-152.151</td>
<td>123.631</td>
</tr>
<tr>
<td>NSSI</td>
<td>4.774</td>
<td>5.859</td>
<td>.067</td>
<td>.419</td>
<td>-7.006</td>
<td>16.555</td>
</tr>
<tr>
<td>DES</td>
<td>.195</td>
<td>2.900</td>
<td>.814</td>
<td>.946</td>
<td>-5.636</td>
<td>6.026</td>
</tr>
<tr>
<td>NSSIxDES</td>
<td>-.202</td>
<td>.245</td>
<td>-.826</td>
<td>.412</td>
<td>-.696</td>
<td>.290</td>
</tr>
<tr>
<td>NA</td>
<td>2.711</td>
<td>4.067</td>
<td>.666</td>
<td>.508</td>
<td>-5.467</td>
<td>10.889</td>
</tr>
<tr>
<td>NSSIxNA</td>
<td>-.276</td>
<td>.272</td>
<td>-1.015</td>
<td>.314</td>
<td>-.823</td>
<td>.270</td>
</tr>
<tr>
<td>DESxNA</td>
<td>-.004</td>
<td>.162</td>
<td>-.029</td>
<td>.977</td>
<td>-.330</td>
<td>.321</td>
</tr>
<tr>
<td>NSSIxDESxNA</td>
<td>.011</td>
<td>.011</td>
<td>1.006</td>
<td>.319</td>
<td>-.011</td>
<td>.035</td>
</tr>
</tbody>
</table>

Note. $R^2 = .1092$, $F(7, 48) = .8404$, $p = .5596$; NSSI = Non-suicidal self-injury; DES = dissociation; NA = Negative Affect

* $p < .05$, † $p < .10$, ** $p < .01$. 
CHAPTER IV

DISCUSSION

Goal of Current Study

The main goal of this study was to examine whether a history of NSSI is associated with altered response to experimentally induced pain and what role dissociation and affect have in the way self-administered pain is experienced.

The first hypothesis proposed that the three groups would differ significantly in their measured pain threshold, where the participants who had engaged in NSSI within the previous 12 months (labeled “current NSSI”) would demonstrate a higher pain threshold than those who had engaged in NSSI prior to the previous 12 months (“past NSSI”) who would demonstrate higher threshold than those without a history of NSSI (“control”). This hypothesis was partially supported, where the current NSSI group demonstrated significantly higher pain threshold; however, the remaining two groups did not differ from one another.

The second hypothesis proposed that the three groups would also differ significantly in their measured pain tolerance in the same pattern proposed above. Again, this hypothesis was partially supported in that the past NSSI group demonstrated significantly higher pain tolerance, though the remaining two groups did not differ from one another.

These findings are consistent with previous research demonstrating differences in pain threshold and pain tolerance based on history of engaging in NSSI (Hooley et al., 2010; Ludäscher et al., 2009). However, these differences did not occur in the step-wise pattern predicted. One possibility is that the controlled laboratory based pain paradigm used did not adequately replicate the variables involved in NSSI.
In their investigation of pain threshold and tolerance in those with and without a history of NSSI, McCoy, Fremouw, and McNeil (2010) were surprised to find no difference between groups on average pain threshold. However, those who had a history of NSSI did differ significantly from controls on pain tolerance. These researchers point to the lack of emotional salience in their pain paradigm (pressure algometer) for NSSI-positive participants, as NSSI often follows emotional distress. The current study also did not provoke a particular emotion, a component which is discussed further below.

To further clarify the mechanisms that may influence an altered response to self-induced pain, potential predictors of increased pain threshold were examined. Though the overall model significantly predicted almost 33% of the variance in pain threshold, no significant individual predictors emerged. However, two variables approached significance, the Helplessness factor of the PCS and the Intrusion factor of the BSL. A second regression was conducted to determine predictors of increased pain tolerance. Similar to the previous hypothesis, the overall model was significant while individual predictors trended towards significance. In this model, the Magnification factor of the PCS and the Self-Destructiveness factor of the BSL trended towards significance. However, an analysis using a more lenient criterion for inclusion of predictors significantly predicted 44.2% of the variance in pain threshold, and the PCS Helplessness subscale emerged as a significant individual predictor. This finding may reflect the collinearity between PCS subscales, as Helplessness was correlated at a smaller magnitude but was a significant individual predictor when included.

While it appears counterintuitive that a higher level of reported pain catastrophizing may be associated with increased pain threshold and pain tolerance, this finding speaks to the importance of perceived controllability of pain in those tending to
catastrophize. Items on the PCS address the perception of loss of control on items such as “I worry all the time about whether the pain will end”, “It’s terrible and I think it’s never going to get any better”, and “I anxiously want the pain to go away.” Individuals who catastrophize about pain in general (as is measured by the PCS) may not find the cold pressor task aversive, as they are instructed that they can remove their hand from the ice water when they find the pain intolerable, thus eliminating any need to worry when the pain will end or fear that it will worsen. In comparison, those low in pain catastrophizing may not experience any increase in pain threshold and tolerance as the ability to control discontinuation has little salience in the way that they experience pain.

When comparing pain intensity in self- versus other-administered pain, Braid and Cahusac (2006) found participants demonstrated higher pain threshold and tolerance on trials of self-administered pain using a pressure algometer when compared to those administered by a research assistant. Müller (2012) examined perceived pain utilizing an electric skin stimulation procedure and found that those who were given a window of time in which to self-administer a shock reported lower pain intensity and unpleasantness compared to those whose shocks were administered by the experimenter.

Another possibility is that the parameters of the cold pressor task were not threatening enough for participants who understood they could end the paradigm at any time. In fact, in the current study approximately 25% of the sample removed their hand before twenty seconds had elapsed. While Karsdorp, Ranson, Schrooten, and Vlaeyen (2012) found no difference in task persistence for those higher on pain catastrophizing between low and high threat conditions, they found high pain catastrophizers persisted in their pain paradigm when assigned to a positive mood. The authors posit that negative mood serves as an internal cue for level of threat regardless of external cues for pain.
While in the current study participants were allowed to initiate the task when they chose to, the cold pressor paradigm differs from NSSI in that the method used is chosen or even desired and anticipated. Further, through repeated utilization of NSSI the prospect of self-injury may pre-emptively begin a cascade of neurobiological changes, such as a release of endogenous opioids or dopamine (Bandelow et al., 2010).

The finding of a trend towards prediction of the Intrusion and Self-destruction subscales of the BSL is expected, particularly when considering the content of these scales. As reported by Bohus and colleagues (2007), items with the highest loading on the Intrusions subscale include feeling “I had different people inside me” and “felt the presence of someone who was not really there” (which are similar to descriptions of dissociative symptoms) while items with the highest loading on the Self-destruction subscale included “longing for death” and “fascination of death.” For individuals scoring highly on these subscales pain may be felt as occurring to someone else or may be a welcome sensation for those preoccupied with thoughts of death.

Those who endorse intrusive symptoms may experience pain similarly to those described by Huband and Tantam (2004) whose previously mentioned narratives of self-injury included descriptions such as feeling as if the injury “was to another person’s arm, not really mine” (p. 421). It is notable that while intrusive symptoms are described similarly to the sensation of depersonalization, in the current study dissociation as measured by the DES was significantly correlated with pain response but was not significantly predictive. Perhaps elements of dissociation, such as depersonalization, may be more strongly associated with pain experiences than dissociation as a whole.

With regard to the Self-destruction subscale, one mechanism which may explain the trend towards increased pain threshold and tolerance is that which is presented in
Joiner’s (2005) interpersonal theory of suicide which proposes that an acquired capability for suicide results from the experience of painful and provocative events. By experiencing these events, tolerance for pain is increased and fear of pain and death is reduced. However, in the current study, painful and provocative events were not predictive of increased pain threshold or tolerance.

Additional regressions were conducted to determine predictors of significant change in negative and positive affect prior to and following completion of the cold pressor task. When using the more stringent magnitude of .350 as the cutoff for significant correlates, only one regression was conducted, with the BSL Intrusion subscale significantly predicting decrease in negative affect following the pain paradigm. Using the more lenient cutoff of .250 for magnitude of correlates entered into the regression model, BSL Intrusion remained the only individual significant predictor of decrease in negative affect following the CPT with 27.2% of the variance in decrease in negative affect accounted for. This may indicate that when pain catastrophizing, emotional clarity, and self-perception is parsed out, individuals scoring higher in Intrusion experience a greater decrease in negative affect following the CPT. These results show sensations similar to depersonalization may play a role in the shifting of negative emotion after a painful experience.

The magnification subscale of the Pain Catastrophizing Scale approached significance in predicting decrease in positive affect following the cold pressor task. Items on this scale describe fearing pain will get worse, thinking of other painful experiences, and wondering whether something serious will happen. It appears individuals high on this subscale may continue to worry about pain even after the removal of the painful stimulus, and their attention may be turned towards recollection of
past painful events or fear of future painful events. Because of this, they may experience less positive affect even after the end of the pain paradigm.

Additional regressions were conducted to determine potential moderating variables between NSSI frequency and pain outcomes. The interaction between NSSI frequency, dissociation, and negative affect did significantly predict pain threshold but not pain tolerance. In particular, the frequency of NSSI predicted higher pain threshold when negative affect and dissociation are high.

Overall, the current study demonstrated differences in pain response (both threshold and tolerance) for those individuals who have never engaged in NSSI, had engaged in NSSI in the previous year, and those who had engaged in NSSI in the remote past. Rather consistently, attitudes about pain (i.e., pain catastrophizing) and borderline personality traits (particularly intrusive experiences and self-destructive orientation) either significantly predicted or trended towards prediction of increased pain threshold and tolerance and reductions of both positive and negative affect following the completion of the cold pressor task. In fact, some variables that trended towards predictive value became significant predictors upon use of less stringent cut-offs for the magnitude of correlates to be entered into regressions. This finding suggests that with a larger sample size and greater statistical power, the predictive value of relevant variables will become clearer.

It is also notable that the interaction among NSSI frequency, dissociation, and negative affect did significantly predict pain threshold but not pain tolerance. Of note the interaction demonstrated a moderation wherein the frequency of NSSI predicted higher pain threshold when negative affect and dissociation are high. This is what would be expected, given high negative affect and dissociation are both considered individual risk
factors for engaging in NSSI. At times when negative affect is high and individuals are experiencing dissociation, they may be less likely to perceive the initial act of self-injury as painful, but perhaps they do not exhibit a difference in their ability to tolerate pain once it is perceived.

Limitations of the Current Study

The most pressing limitation to the current study is the small sample size utilized, particularly in NSSI groups (both past and current). This is particularly salient for those hypotheses utilizing regressions, especially those with significant overall models that failed to find individual significant predictors. More data would lead to more accurate parameter estimates as standard error decreases, and the effects of multicollinearity would likely be reduced. To address this, recruitment and data collection continue in an effort to boost statistical power to find group differences.

In conjunction with the above, the current sample utilized an undergraduate sample. In their review of the literature, Jacobson and Gould (2007) note that NSSI rates appear to be increasing (though this is difficult to verify without large-scale epidemiological studies), and undergraduate samples have endorsed NSSI in rates of up to 35% (Gratz, Conrad, & Roemer, 2002). No longer is NSSI viewed as a behavior that occurs strictly within the context of borderline personality disorder and inpatient samples. However, is it unknown whether the results of the current study would be generalizable to other populations, such as clinical populations or non-clinical general populations. Thus, further research in non-student samples is suggested.

The current study utilized a sample of individuals with and without a history of NSSI meeting specific criteria – having engaged in a behavior that was immediate, deliberate and voluntary with the intention of damaging one’s own body tissues without
suicidal intent. Other behaviors that could be damaging on a long-term basis (i.e., those considered self-destructive) such as substance use or disordered eating were not considered as they did not meet these criteria. However, there is evidence that individuals engaging in these self-destructive behaviors demonstrate responses to pain that are more similar to those with a history of NSSI than those who do not. St. Germain and Hooley (2013) examined pain perception in what they term direct (NSSI) and indirect (self-destructive behavior) self-injury utilizing a pressure algometer. Results showed those reporting indirect forms of NSSI (including substance abuse, disordered eating, staying in abusive relationships, and other risky or reckless behaviors) differed significantly from controls on pain threshold and tolerance but did not differ from those with a history of direct NSSI.

The current study did not evaluate self-destructive behaviors (or, indirect NSSI as it is termed by St. Germain and Hooley), but the differences between groups may have been attenuated by the strict criteria for inclusion into specific conditions given the finding that the pain response in those who engage in self-destructive behaviors more closely matches that of those who have engaged in NSSI than those who have not.

Another potential limitation to the current study was the lack of a mood induction to control for the state mood of participants as they completed the cold pressor task. In their examination of the thermal grill illusion (a pain paradigm consisting of alternating hot and cold water), Boettger, Schwier, and Bär (2011) found a sad mood induction (the Velten mood induction procedure paired with subjectively reported sad music) increased sensitivity to pain and self-reported discomfort when compared to those who completed a neutral mood induction.
Weinberg and Klonsky (2012) also utilized a mood induction procedure prior to completion of a pain paradigm (electric shocks); however, these researchers induced anger rather than sadness. Participants were instructed to write about an event in which they felt anger while attempting to fully experience the emotion felt at the time. Anger was chosen over sadness as it was considered to be more emotionally arousing than sadness. As expected, those with a history of NSSI demonstrated greater levels of pain analgesia than controls. Further, those who had engaged in NSSI and were assigned to a high-shock condition who also reported lower levels of pain also evidenced the greatest reductions of negative emotional arousal following the administration of shocks. An additional finding of this study was that those who had self-injured showed a greater change in mood following the angry mood induction, which speaks to the lability of mood often associated with self-injury.

A mood induction was also used by Karsdorp et al. (2012) to prompt both positive and negative mood, where participants watched clips chosen to elicit happiness or sadness. Manipulation checks demonstrated significant change to the intended mood which persisted throughout their pain paradigm, unlike the previous studies which evidenced change in mood following self-administered pain. Notably, these researchers did not assess for history of NSSI in their sample.

Citing the association between emotional distress and physical pain, Gratz and colleagues (2011) examined the moderating role of interpersonal distress in their emotion induction conditions utilizing personal narratives of neutral or upsetting interactions. Their results suggested higher pain tolerance among individuals with a history of NSSI, but only when in the condition recalling interpersonal distress. The current study did not seek to replicate any interpersonal factors, but additional research should consider
interpersonal motivations as a predictor of altered pain response as current theories describing functions of NSSI point to both intrapersonal and interpersonal factors (Klonsky, 2007; Nock & Prinstein, 2004).

Another potential limitation of the study was the inclusion of participants who had self-injured regardless of frequency of the behavior. Because of this, participants who had only experimented with self-injury may have been included. That individuals may try NSSI on a few occasions but not repetitively engage in NSSI is considered in the diagnostic criteria in the DSM-5 where NSSI is considered a condition needing further study; that criterion delineates that the behavior must have been engaged in at least five times within the past year. In the current sample, frequency of endorsed self-injurious acts ranged from 8 to 107. Additionally, no difference in NSSI frequency was found between the two NSSI conditions, $t(26) = -1.038$, $p = .309$. While all participants in NSSI groups would meet the criteria set for the DSM-5, it is unclear what number of them could be considered “habitual” self-injurers, though it is known that the number of NSSI acts indicates severity of the behavior (Manca, Presaghi, & Cerutti, 2014).

Lastly, utilization of psychotherapy or other mental health treatment was not assessed in the current study. This may be particularly relevant for those who no longer engage in NSSI, as Rotolone and Martin (2012) found 54% of those who “gave up” NSSI sought mental health treatment in the past and 78% of them reported treatment had been helpful in discontinuing NSSI behaviors.

Strengths of the Current Study

One strength of the current study is the consideration of changes to both negative and positive affect following completion of a laboratory pain paradigm. Most research to date has focused on NSSI as a mechanism for reducing negative affect. Using ecological
momentary assessment, Nock, Prinstein, and Sterba (2010) assessed reported functions of NSSI and found that while 64.7% of NSSI episodes were motivated by intrapersonal negative reinforcement (i.e., to reduce negative affect), the second most commonly reported function (24.5%) of NSSI was motivated by intrapersonal positive reinforcement (i.e., to increase positive affect). However, in the current study few variables were significantly and strongly correlated (in either direction) with change in positive affect before and after the pain paradigm, with pain attitudes showing a trend towards predicting decrease in positive affect.

Another strength of the current study is the inclusion of both genders as research regarding gender differences in NSSI has been inconclusive. A review of the literature indicates that NSSI is most common among female European Americans (Jacobson & Gould, 2007). Conversely, in a community sample, Briere and Gil (1998) found no significant gender differences between thirty-three participants who reported NSSI in the previous six months (4% of females versus 3% of males). Laye-Gindhu and Schonert-Reichl (2005) suggest past studies finding gender differences in NSSI may be due to socialization and the way NSSI is assessed. For instance, behaviors such as punching windows or walls or climbing in precarious places are more acceptable behaviors in males than females. Additionally, when an individual's self-injury is serious, women are more likely to seek medical treatment and be honest about the cause of their injuries, while the self-injury of men is more often mislabeled as accidental. Also, many studies examining self-injury have relied on borderline personality disorder-only samples, which may skew results since BPD is more likely to be diagnosed in females (Muehlenkamp, 2005).
An additional strength of the study is the ethnic diversity of the sample. Ethnicity is another vague area in the NSSI literature. In their review of the literature on adolescent self-injury, Jacobson and Gould (2007) examined six articles based on community samples. Two found self-injury to be higher in Caucasians than non-Caucasians, one found no difference, and the other three studies did not statistically examine differences in NSSI and ethnicity. The lack of large scale epidemiological studies hinders broad conclusions about which, if any, ethnic group is at greatest risk for self-injury. Klonsky (2007) points out that most research shows a trend towards Caucasians being at higher risk than other ethnicities, as no study has found lower rates in Caucasians than non-Caucasians.

Because previous research has been equivocal regarding possible demographic differences, the current research had no limitations or exclusions based on gender, race, or ethnicity.

Suggestions for Future Research

There are many areas of potential exploration to consider in future research. One of these is determining which characteristics are most predictive of “giving up” NSSI. Research to determine risk factors for NSSI is increasing, but to date there is little research focused on the reasons for which individuals who had engaged in NSSI decide to stop. Whitlock, Powers, and Eckenrode (2006) found that among college students who had engaged in NSSI, 40% stop within one year, and 80% reported stopping within five years. Rotolone and Martin (2012) point to the role of social support, but little consideration has been given to intrinsic characteristics or use of other coping skills.

These researchers found significant differences in perceived social support between groups (with participants assigned to NSSI groups in the same manner as the
current study). Results showed a stepwise pattern where controls scored significantly higher than the past NSSI group who in turn scored significantly higher than the current NSSI group on perceived family support and social connectedness. However, one limitation to this study is that it is unknown whether improved social support predicts discontinued use of NSSI or results from it.

Do individuals who discontinue NSSI do so because they have found alternative ways to cope, or do they move on to other avoidant coping techniques (e.g., substance abuse)? Brown, Williams, and Collins (2007) showed individuals with a history of past but not current NSSI use had the highest rates of substance abuse in their sample. These researchers also question the potential for relapse into use of NSSI, similar to the relapse rate of those with depressive disorders and substance use disorders. Further understanding of the reasons why NSSI is discontinued or why some individuals may remit back into NSSI use would inform intervention choices.

Alternatively, are there protective factors that keep individuals from maintaining NSSI behaviors? One such factor could be resilience, which is influential in persevering through both psychological distress and physical pain. In comparing characteristics differentiating past and current self-injurers, Rotolone and Martin (2012) measured resilience and found control participants demonstrated greater resilience than those with a past history of NSSI, and current self-injurers scored lowest of all conditions.

Goodin et al. (2013) posited resilience likely played a role in pain response in a sample of older adults with osteoarthritis. Specifically, they found dispositional optimism (an important component of resilience) was found to be associated with lower levels of pain catastrophizing and reported pain sensitivity. However, resilience per se was not measured in their study.
A study by Orbach and colleagues (1996) compared individuals admitted to an emergency department following either an accident or suicide attempt as well as control participants from the community on number of electric shocks self-administered. Those admitted for a suicide attempt administered a greater number of shocks than controls, who in turn administered a greater number of shocks than accident victims. Those admitted for suicide attempts also reported these shocks were less painful than controls, who reported less pain than accident victims. Participants also completed a hardiness scale, and results showed controls scored significantly higher than accident victims and attempters scoring lowest. While this study examined suicide attempters and excluded those admitted for NSSI, it is likely that the pattern would remain for self-injurers as both actions involve self-administered pain.

Another avenue for consideration is the way in which participants endorsing NSSI are grouped. While the current study examined differences between groups based on time since last NSSI commensurate with previous research (Hooley et al., 2010; Rotolone & Martin, 2012), other research has examined specific NSSI groups based on different criteria. For instance, Hasking, Momeni, Swannell, and Chia (2008) determined a grouping based on frequency, recency, and severity and weighted by the number of NSSI methods used. Groups were labeled mild, moderate, and severe NSSI. The researchers found groups demonstrated higher levels of pathology on measures of general distress and emotion dysregulation as severity of NSSI increased.

Whitlock, Muehlenkamp, and Eckenrode (2008) conducted a similar severity grouping utilizing latent class analysis, finding lifetime frequency of NSSI, number of forms used, and potential for tissue damage best fit in their model. The three distinct groups were labeled “superficial NSSI,” “moderate severity NSSI,” and “high severity
Among those who engaged in NSSI, the high severity NSSI group differed from the others; members were significantly more likely to report unintended NSSI severity, addiction, friends who self-injure, disordered eating, suicidality, use of psychotropic medications, NSSI-related life interference, having a routine for NSSI, having a history of abuse (of all forms), and having received therapy. Though contrasts are most stark between those considered to exhibit the most severe forms of NSSI, these differences also highlight the need for early intervention so that individuals evidencing superficial or mild NSSI do not progress to higher severity behaviors.

Klonsky and Olino (2008) also conducted a latent class analysis in a sample of undergraduates who endorsed engaging in self-injury and found four distinct groups with differences in method and function of self-injury. The researchers labeled one group, consisting of 61% of the sample as “experimental NSSI,” and this group was associated with the fewest clinical symptoms. Their second group consisted of 17% of their sample and evidenced earlier onset of NSSI and slightly more borderline symptoms but were still relatively low on other clinical symptoms. The third (11%) and fourth (10%) groups reported multiple reinforcement functions (e.g., automatic negative reinforcement and automatic positive reinforcement) along with greater severity of clinical symptoms. The authors also point out that within a non-clinical sample, in their case a sample of undergraduate volunteers, 20% of those individuals endorsing a history of NSSI exhibit a considerable level of clinical symptoms, including depression, anxiety, borderline symptomatology, and a history of suicide attempts.

Lastly, future research should consider the limitations to laboratory-based examinations of NSSI. Nock et al. (2010) cited the difficulty of replicating the conditions that precede NSSI in laboratory paradigms in their use of ecological momentary
assessment to measure the form and function of self-injurious thoughts and behaviors. By using palm pilots or other comparable devices, study participants are prompted to record thoughts, feelings, and behaviors over an extended period of time, allowing for measurement in a more natural environment.

In their investigation, the researchers found self-injurious thoughts and behaviors (in that study suicidal thoughts and behaviors were included) occurred most frequently in the context of negative mood states including sadness and worthlessness, feeling overwhelmed, scared, or anxious. Participants were more likely to advance from NSSI thoughts to acts following feelings of rejection, anger towards the self, self-hatred, numbness, and anger towards another. Further, participants noted self-injurious thoughts most often occurred when socializing, resting, or listening to music. As such, it may be difficult to produce laboratory procedures that are as salient to participants who have utilized NSSI as a coping mechanism due to the variety of intrapersonal and interpersonal contexts and stimuli which spark the thoughts or urges to self-injure.

Ecological momentary assessment has also been successfully utilized in a sample of women diagnosed with bulimia nervosa to determine the role of affective lability in the association between suicide attempts and NSSI (Anestis et al., 2012). In that study, participants completed assessments of mood (using the PANAS) multiple times per day for two weeks. This allows for a more naturalistic study of affect shifts which occur over a period of time that could not be considered in more limited laboratory studies.

Conclusions

The main purpose of the current study was to examine the group differences in pain threshold and tolerance in those who have a history of non-suicidal self-injury, and to determine the role of affect, dissociation, and pain attitudes in this association. From
the current results, it can be concluded that there are differences in pain response based on history of NSSI; although they were not significant independent predictors, pain catastrophizing and borderline personality symptoms (such as intrusion and self-destructiveness) trended towards predictive value. The current study yielded a significant result for dissociation and negative affect moderating the relation between frequency of NSSI and pain threshold but not pain tolerance. A number of potential limitations were discussed, including the low sample size, inability of the laboratory pain paradigm to replicate the sensation of NSSI, and omission of a mood induction. Suggestions for future research are made, such as use of different variables to group those with history of NSSI, consideration of factors predicting discontinued use of NSSI, and use of ecological momentary assessment to research NSSI in a more naturalistic approach.
APPENDIX A

MEASURES USED IN THE CURRENT STUDY

AIM (Larsen & Diener, 1987)

The following questions refer to emotional reactions to typical life-events. Please indicate how YOU react to these events by placing a number from the following scale on the line beside each item. Please base your answers on how YOU react, not on how you think others react or how you think a person should react.

________________________________________________________________________

1------------------2------------------3------------------4------------------5------------------6
never almost occasionally usually almost always
never always

________________________________________________________________________

____   1) When I accomplish something difficult I feel delighted or elated.
____   2) When I feel happy it is a strong type of exuberance.
____   3) I enjoy being with other people very much.
____   4) I feel pretty bad when I tell a lie.
____   5) When I solve a small personal problem, I feel euphoric.
____   6) My emotions tend to be more intense than those of most people.
____   7) My happy moods are so strong that I feel like I’m “in heaven.”
____   8) I get overly enthusiastic.
____   9) If I complete a task I thought was impossible, I am ecstatic.
____  10) My heart races at the anticipation of some exciting event.
____  11) Sad movies deeply touch me.
12) When I’m happy it’s a feeling of being untroubled and content rather than being zestful and aroused.

13) When I talk in front of a group for the first time, my voice gets shaky and my heart races.

14) When something good happens, I am usually much more jubilant than others.

15) My friends might say I’m emotional.

16) The memories I like the most are those of times when I felt content and peaceful rather than zestful and enthusiastic.

17) The sight of someone who is hurt badly affects me strongly.

18) When I’m feeling well it’s easy for me to go from being in a good mood to really joyful.

19) “Calm and cool” could easily describe me.

20) When I’m happy I feel like I’m bursting with joy.

21) Seeing a picture of some violent car accident in a newspaper makes me feel sick to my stomach.

22) When I’m happy I feel very energetic.

23) When I receive an award I become overjoyed.

24) When I succeed at something, my reaction is calm contentment.

25) When I do something wrong I have strong feelings of shame and guilt.

26) I can remain calm even on the most trying days.

27) When things are going well I feel “on top of the world.”

28) When I get angry it’s easy for me to still be rational and not overreact.
29) When I know I have done something very well, I feel relaxed and content rather than excited and elated.

30) When I do feel anxiety, it is normally very strong.

31) My negative moods are mild in intensity.

32) When I am excited over something, I want to share my feelings with everyone.

33) When I feel happiness, it is a quiet type of contentment.

34) My friends would probably say I’m a tense or “high-strung” person.

35) When I’m happy I bubble over with energy.

36) When I feel guilty, this emotion is quite strong.

37) I would characterize my happy moods as closer to contentment than to joy.

38) When someone compliments me, I get so happy I could “burst.”

39) When I am nervous I get shaky all over.

40) When I am happy the feeling is more like contentment and inner calm than one of exhilaration and excitement.
APPENDIX B

BSL (Bohus et al., 2007)

Please follow these instructions when answering the questionnaire:

In the following table you will find a set of difficulties and problems which possibly describe you. Please work through the questionnaire and decide how much you suffered from each problem in the course of the last week. In case you have no feelings at all at the present moment, please answer according to how you think you might have felt.

Please answer honestly. All questions refer to the last week. If you felt different ways at different times in the week, give a rating for how things were for you on average. Please be sure to answer each question.

In the course of last week...

0 1 2 3 4
not at all a little rather much very strong

_____ I felt stressed out
_____ I suffered from insomnia
_____ I felt like I was not noticed by others
_____ I was suffering from massive states of anxiety
_____ It was hard for me to concentrate
_____ I didn’t know what to do with myself
_____ I felt helpless
_____ Everything felt tight inside of me
_____ I was torn apart inside
I was afraid of making mistakes
I thought nobody could help me
I was absent-minded and unable to remember what I was actually doing
I rejected other people that I used to like
I looked upon myself as an object, not as a human being
I felt depressed
I felt paralyzed
I could hardly talk
I was longing for death
I was envious of other people
I felt disgust
I was confident
I thought of hurting myself
It was difficult for me to perceive my emotions
There was no one to whom I was really important
I found myself in a certain place and was not able to remember how I got there
I was calm inside
I didn’t trust other people
I didn’t believe in my right to live
I was lonely
I experienced stressful inner tension
I was afraid of being abandoned by someone close to me
I had images that I was very much afraid of
I didn’t feel alive
I could not bear other people’s closeness
I hated myself
I experienced parts of my body dissolving
Everyday decisions were difficult for me
I wanted to punish myself
I felt energetic
I was angry
I could hardly control my memories
It was hard for me to be alone
I couldn't feel parts of my body
I felt threatened
I terminated relationships all of a sudden
I had no idea of who I really was
I suffered from shame
I felt isolated from others
My mood rapidly cycled in terms of anxiety, anger, and depression
I felt insecure
I felt abandoned
I felt the presence of someone who was not really there
I was aggressive
I felt kind of cut off from myself
I was happy
I found myself in emotional chaos
I was tortured by images
I felt empty inside
I was unable to touch parts of my body
I was irritated
It felt as if I was petrified
I suffered from suicidal thoughts
I was well-balanced
I had difficulties with other people
Nobody realized how I was really feeling
I suffered from voices and noises from outside my head
I suffered from voices and noises from inside my head
I felt free and easy
Criticism had a devastating effect on me
I needed to have someone with me
I felt as if I was standing beside myself
I felt powerful
I felt vulnerable
The idea of death had a certain fascination for me
I felt deficient
I had the feeling of being inadequate
I was full of despair
I suffered from nightmares
I was afraid people would see through me
I felt relaxed
I felt as if I had different people inside of me
I found my body completely unacceptable in its present state
I was suffering from feelings of guilt
I believed that nobody could understand me
Everything seemed senseless to me
I felt I had to give in to my bad thoughts
I was afraid of losing control
I felt disgusted by myself
I was not able to accept other people's help
I felt as if I was far away from myself
I was overwhelmed by my feelings
I felt numb
I felt hopeless
I felt worthless
I was content

Please rate the quality of your overall personal state in the course of the last week.

0 means absolutely down, 100 means excellent. Please circle which comes closest.

0 10 20 30 40 50 60 70 80 90 100

(very bad) (excellent)
APPENDIX C

CES-D (Radloff, 1977)

Below is a list of some of the ways you may have felt or behaved.

Please indicate how often you have felt this way during the past week:

(place one number on each line)

0 = Rarely or none of the time (less than 1 day)
1 = Some or a little of the time (1-2 days)
2 = Occasionally or a moderate amount of time (3-4 days)
3 = All of the time (5-7 days)

_____ 1. I was bothered by things that usually don’t bother me
_____ 2. I did not feel like eating: my appetite was poor
_____ 3. I felt that I could not shake off the blues even with help from my family
_____ 4. I felt that I was just as good as other people
_____ 5. I had trouble keeping my mind on what I was doing
_____ 6. I felt depressed
_____ 7. I felt that everything I did was an effort
_____ 8. I felt hopeful about the future
_____ 9. I thought my life had been a failure
_____ 10. I felt fearful
_____ 11. My sleep was restless
_____ 12. I was happy
_____ 13. I talked less than usual
14. I felt lonely
15. People were unfriendly
16. I enjoyed life
17. I had crying spells
18. I felt sad
19. I felt that people disliked me
20. I could not “get going”
APPENDIX D

DSHI (Gratz, 2001)

This questionnaire asks about a number of different things that people sometimes do to hurt themselves. Please be sure to read each question carefully and respond honestly. Often, people who do these kinds of things to themselves keep it a secret, for a variety of reasons. However, honest responses to these questions will provide us with greater understanding and knowledge about these behaviors and the best way to help people. Please answer yes to a question only if you did the behavior intentionally, or on purpose, to hurt yourself. Do not respond yes if you did something accidentally (e.g., you tripped and banged you head on accident). Also, please be assured that your responses are completely confidential.

1. Have you ever intentionally (i.e., on purpose) cut your wrist, arms, or other area(s) of your body (without intending to kill yourself)? (Select one):

   1. Yes  
   2. No

   If yes,

   How old were you when you first did this? ________________

   How many times have you done this? Please write an actual number (e.g., 1, 5, or 15 NOT some, many, or few). ________________

   When was the last time you did this? ________________

   How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?) Please write the actual number of years you engaged in this behavior. ________________

   Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? ________________
2. Have you ever intentionally (i.e., on purpose) burned yourself with a cigarette? (Select one):

1. Yes                            2. No

If yes,

How old were you when you first did this? ________________

How many times have you done this? Please write an actual number (e.g., 1, 5, or 15 NOT some, many, or few). ________________

When was the last time you did this? ________________

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?) Please write the actual number of years you engaged in this behavior. ________________

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? ________________
3. Have you ever intentionally (i.e., on purpose) burned yourself with a lighter or a match? (Select one):

1. Yes                            2. No

If yes,

How old were you when you first did this? ________________

How many times have you done this? Please write an actual number (e.g., 1, 5, or 15 NOT some, many, or few). ________________

When was the last time you did this? ________________

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?) Please write the actual number of years you engaged in this behavior. ________________

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? _______________________
4. Have you ever intentionally (i.e., on purpose) carved words into your skin? (Select one):

1. Yes
2. No

If yes,

How old were you when you first did this? ________________

How many times have you done this? Please write an actual number (e.g., 1, 5, or 15 NOT some, many, or few). ________________

When was the last time you did this? ________________

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?) Please write the actual number of years you engaged in this behavior. ________________

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? ______________________
5. Have you ever intentionally (i.e., on purpose) carved pictures, designs, or other marks into your skin? (Select one):

1. Yes  2. No

If yes,

How old were you when you first did this? ________________

How many times have you done this? Please write an actual number (e.g., 1, 5, or 15 NOT some, many, or few). ________________

When was the last time you did this? ________________

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?) Please write the actual number of years you engaged in this behavior. ________________

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? ________________
6. Have you ever intentionally (i.e., on purpose) severely scratched yourself, to the extent that scarring or bleeding occurred? (Select one):

1. Yes  
2. No

If yes,

How old were you when you first did this? ________________

How many times have you done this? Please write an actual number (e.g., 1, 5, or 15 NOT some, many, or few). ________________

When was the last time you did this? ________________

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?) Please write the actual number of years you engaged in this behavior. ________________

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? ________________
7. Have you ever intentionally (i.e., on purpose) bit yourself, to the extent that you broke the skin? (Select one):

1. Yes  
2. No

If yes,

How old were you when you first did this? ________________

How many times have you done this? Please write an actual number (e.g., 1, 5, or 15 NOT some, many, or few). ________________

When was the last time you did this? ________________

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?) Please write the actual number of years you engaged in this behavior. ________________

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? _________________________
8. Have you ever intentionally (i.e., on purpose) rubbed sandpaper on your body? (Select one):

1. Yes                            2. No

If yes,

How old were you when you first did this? ________________

How many times have you done this? Please write an actual number (e.g., 1, 5, or 15 NOT some, many, or few). ________________

When was the last time you did this? ________________

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?) Please write the actual number of years you engaged in this behavior. ________________

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? ________________
9. Have you ever intentionally (i.e., on purpose) dripped acid onto your skin? (Select one):

If yes,

How old were you when you first did this? ________________

How many times have you done this? Please write an actual number (e.g., 1, 5, or 15 NOT some, many, or few). _________________

When was the last time you did this? _________________

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?) Please write the actual number of years you engaged in this behavior. _________________

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? _________________________
10. Have you ever intentionally (i.e., on purpose) used bleach, comet, or oven cleaner to scrub your skin? (Select one):

1. Yes  2. No

If yes,

How old were you when you first did this? ________________

How many times have you done this? Please write an actual number (e.g., 1, 5, or 15 NOT some, many, or few). ________________

When was the last time you did this? ________________

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?) Please write the actual number of years you engaged in this behavior. ________________

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? ___________________
11. Have you ever intentionally (i.e., on purpose) stuck sharp objects such as needles, pins, staples, etc. into your skin, not including tattoos, ear piercing, needles used for drug use, or body piercing? (Select one):

1. Yes  
2. No

If yes,

How old were you when you first did this? 

How many times have you done this? Please write an actual number (e.g., 1, 5, or 15 NOT some, many, or few). 

When was the last time you did this? 

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?) Please write the actual number of years you engaged in this behavior. 

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment?
12. Have you ever intentionally (i.e., on purpose) rubbed glass into your skin? (Select one):

1. Yes                            2. No

If yes,

How old were you when you first did this? ________________

How many times have you done this? Please write an actual number (e.g., 1, 5, or 15 NOT some, many, or few). ________________

When was the last time you did this? ________________

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?) Please write the actual number of years you engaged in this behavior. ________________

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? ________________
13. Have you ever intentionally (i.e., on purpose) broken your own bones? (Select one):

1. Yes                            2. No

If yes,

How old were you when you first did this? ________________

How many times have you done this? Please write an actual number (e.g., 1, 5, or 15 NOT some, many, or few). ________________

When was the last time you did this? ________________

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?) Please write the actual number of years you engaged in this behavior. ________________

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? ________________
14. Have you ever intentionally (i.e., on purpose) banged your head against something, to the extent that you caused a bruise to appear? (Select one):

1. Yes 2. No

If yes,

How old were you when you first did this? ________________

How many times have you done this? Please write an actual number (e.g., 1, 5, or 15 NOT some, many, or few). ________________

When was the last time you did this? ________________

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?) Please write the actual number of years you engaged in this behavior. ________________

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? _________________________
15. Have you ever intentionally (i.e., on purpose) punched yourself, to the extent that you caused a bruise to appear? (Select one):

1. Yes 2. No

If yes,

How old were you when you first did this? ________________

How many times have you done this? Please write an actual number (e.g., 1, 5, or 15 NOT some, many, or few). ________________

When was the last time you did this? ________________

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?) Please write the actual number of years you engaged in this behavior. ________________

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? ________________
16. Have you ever intentionally (i.e., on purpose) prevented wounds from healing? (circle one):

   1. Yes  2. No

If yes,

   How old were you when you first did this? ________________

   How many times have you done this? Please write an actual number (e.g., 1, 5, or 15 NOT some, many, or few). ________________

   When was the last time you did this? ________________

   How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?) Please write the actual number of years you engaged in this behavior. ________________

   Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? ________________
17. Have you ever intentionally (i.e., on purpose) done anything else to hurt yourself that was not asked about in this questionnaire? (Select one):

1. Yes 2. No

If yes,

How old were you when you first did this? ________________

How many times have you done this? Please write an actual number (e.g., 1, 5, or 15 NOT some, many, or few). ________________

When was the last time you did this? ________________

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?) Please write the actual number of years you engaged in this behavior. ________________

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? ________________
APPENDIX E

DSI-SS (Metalsky & Joiner, 1997)

Instructions: on this questionnaire are groups of statements. Please read all of the
statements in a given group. Pick out and circle the one statement in each group that
describes you best for the past two weeks. If several statements in a group seem to apply
to you, pick the one with the higher number. Be sure to read all of the statements in each
group before making your choice.

(A) 0 I do not have thoughts of killing myself.
    1 Sometimes I have thoughts of killing myself.
    2 Most of the time I have thoughts of killing myself.
    3 I always have thoughts of killing myself.

(B) 0 I am not having thoughts about suicide.
    1 I am having thoughts about suicide but have not formulated any plans.
    2 I am having thoughts about suicide and am considering possible ways of
doing it.
    3 I am having thoughts about suicide and have formulated a definite plan.

(C) 0 I am not having thoughts about suicide.
    1 I am having thoughts about suicide but have these thoughts completely
under my control.
    2 I am having thoughts about suicide but have these thoughts somewhat
under my control.
    3 I am having thoughts about suicide but have little or no control over these
thoughts.

(D) 0 I am not having impulses to kill myself.
1  In some situations I have impulses to kill myself.
2  In most situations I have impulses to kill myself.
3  In all situations I have impulses to kill myself.
APPENDIX F

DERS (Gratz & Roemer, 2006)

Please indicate how often the following statements apply to you by noting the appropriate number from the scale below on the line beside each item:

________________________________________________________________________

-----1------------------2---------------3-----------------4--------------------5--------

almost never           sometimes    about half the time    most of the time    almost always

(0-10%)            (11-35%)     (36-65%)          (66-90%)            (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 that 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 G

DES (Bernstein & Putnam, 1986)

This questionnaire consists of twenty-eight questions about experiences that you may have in your daily life. We are interested in how often you have these experiences. It is important, however, that your answers show how often these experiences happen to you when you are not under the influence of alcohol or drugs.

1. Some people have the experience of driving or riding in a car or bus or subways and suddenly realize that they don’t remember what has happened during all or part of the trip. Select a number to show what percentage of the time this happens to you.

0%  10  20  30  40  50  60  70  80  90  100%

2. Some people find that sometimes they are listening to someone talk and they suddenly realize that they did not hear part or all of what was said. Select a number to show what percentage of the time this happens to you.

0%  10  20  30  40  50  60  70  80  90  100%

3. Some people have the experience of finding themselves in a place and having no idea how they got there. Select a number to show what percentage of the time this happens to you.

0%  10  20  30  40  50  60  70  80  90  100%
4. Some people have the experience of finding themselves dressed in clothes that they don’t remember putting on. Select a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

5. Some people have the experience of finding new things among their belongings that they do not remember buying. Select a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

6. Some people sometimes find that they are approached by people that they do not know who call them by another name or insist that they have met them before.

Select a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

7. Some people sometimes have the experience of feeling as though they are standing next to themselves or watching themselves do something and they actually see themselves as if they were looking at another person. Select a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%
8. Some people are told that they sometimes do not recognize friends or family members. Select a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

9. Some people find that they have no memory for some important events in their lives (for example, a wedding or graduation). Select a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

10. Some people have the experience of being accused of lying when they do not think that they have lied. Select a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

11. Some people have the experience of looking in a mirror and not recognizing themselves. Select a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%
12. Some people have the experience of feeling that other people, objects and the world around them are not real. Select a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

13. Some people have the experience of feeling that their body does not seem to belong to them. Select a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

14. Some people have the experience of sometimes remembering a past event so vividly that they feel as if they were reliving that event. Select a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

15. Some people have the experience of not being sure whether things that they remember happening really did happen or whether they just dreamed them. Select a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%
16. Some people have the experience of being in a familiar place but finding it strange and unfamiliar. Select a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

17. Some people find that when they are watching television or a movie they become so absorbed in the story that they are unaware of other events happening around them. Select a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

18. Some people find that they become so involved in a fantasy or daydream that it feels as though it were really happening to them. Select a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

19. Some people find that they sometimes are able to ignore pain. Select a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

20. Some people find that they sometimes sit staring off into space, thinking of nothing, and are not aware of the passage of time. Select a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%
21. Some people sometimes find that when they are alone they talk out loud to themselves. Select a number to show what percentage of the time this happens to you.

0%  10  20  30  40  50  60  70  80  90  100%

22. Some people find that in one situation they may act so differently compared with another situation that they feel almost as if they were two different people. Select a number to show what percentage of the time this happens to you.

0%  10  20  30  40  50  60  70  80  90  100%

23. Some people sometimes find that in certain situations they are able to do things with amazing ease and spontaneity that would usually be difficult for them (for example, sports, work, social situations, etc.). Select a number to show what percentage of the time this happens to you.

0%  10  20  30  40  50  60  70  80  90  100%

24. Some people sometimes find that they cannot remember whether they have done something or have just thought about doing that (for example, not knowing whether they have just mailed a letter or have just thought about mailing it). Select a number to show what percentage of the time this happens to you.

0%  10  20  30  40  50  60  70  80  90  100%
25. Some people find evidence that they have done things that they do not remember
doing. Select a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

26. Some people sometimes find writings, drawings, or notes among their belongings
that they must have done but cannot remember doing. Select a number to show
what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

27. Some people sometimes find that they hear voices inside their head that tell them
to do things or comment on things that they are doing. Select a number to show
what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

28. Some people sometimes feel as if they are looking at the world through a fog so
that people and objects appear far away or unclear. Select a number to show what
percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%
APPENDIX H
PCS (Sullivan et al., 1995)

Listed below are thirteen statements describing different thoughts and feelings that may be associated with pain. Using the following scale, please indicate the degree to which you have had these thoughts and feelings when you were experiencing pain.

0 1 2 3 4
not at all to a slight degree to a moderate degree to a great degree all the time

_____ 1. I worry all the time about whether the pain will end
_____ 2. I feel I can’t go on
_____ 3. It’s terrible and I think it’s never going to get any better
_____ 4. It’s awful and I feel that it overwhelms me
_____ 5. I feel I can’t stand it any more
_____ 6. I become afraid that the pain may get worse
_____ 7. I think of other painful experiences
_____ 8. I anxiously want the pain to go away
_____ 9. I can’t seem to keep it out of my mind
_____ 10. I keep thinking about how much it hurts
_____ 11. I keep thinking about how badly I want the pain to stop
_____ 12. There is nothing I can do to reduce the intensity of the pain
_____ 13. I wonder whether something serious may happen
APPENDIX I

PPES (Bender, Gordon, & Joiner, 2007)

Please answer the following questions for any time in the past. For each question, please select the best answer.

1. Have you gone skydiving?
   
   1. Never  
   2. Once  
   3. 2-3 Times  
   4. 4-20 Times  
   5. 20+ Times

2. Have you gone rock climbing?
   
   1. Never  
   2. Once  
   3. 2-3 Times  
   4. 4-20 Times  
   5. 20+ Times

3. Have you participated in contact sports (e.g. football, hockey, wrestling, judo)?
   
   1. Never  
   2. Once  
   3. 2-3 Times  
   4. 4-20 Times  
   5. 20+ Times

4. Did you get a tattoo?
   
   1. Never  
   2. Once  
   3. 2-3 Times  
   4. 4-20 Times  
   5. 20+ Times

5. Did you get a piercing?
   
   1. Never  
   2. Once  
   3. 2-3 Times  
   4. 4-20 Times  
   5. 20+ Times

6. Have you been a victim of physical abuse?
   
   1. Never  
   2. Once  
   3. 2-3 Times  
   4. 4-20 Times  
   5. 20+ Times
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<td>7. Have you been a victim of sexual abuse?</td>
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<td>8. Have you been a witness to physical abuse?</td>
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<td>9. Have you been a witness to sexual abuse?</td>
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<td>10. Have you gone on a motorcycle?</td>
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<td>11. Have you shot a gun?</td>
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<td>12. Have you tied a noose?</td>
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<td>13. Have you had surgery?</td>
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14. Have you used intravenous drugs?

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15. Have you broken a bone?

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16. Have you intentionally hurt animals?

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17. Have you dissected animals?

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18. Have you gone bungee jumping?

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19. Have you been in a car accident?

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20. Have you had contact with the police because of criminal activity?

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21. Have you been in physical fights?

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22. Have you jumped from high places (e.g. cliffs, roofs, balconies)?

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23. Have you had injuries requiring medical attention?

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24. Have you been stabbed?

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25. Have you been shot?

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APPENDIX J

PSQ (Ruscheweyh et al., 2009)

This questionnaire contains a series of questions in which you should imagine yourself in certain situations. You should then decide if these situations would be painful for you and if yes, how painful they would be. Let 0 stand for no pain; 1 is an only just noticeable pain and 10 the most severe pain that you imagine or consider possible. Please circle the number on the scale that is most true for you. Keep in mind that there are no “right” or “wrong” answers; only your personal assessment of the situation counts. Please try as much as possible not to allow your fear or aversion of the imagined situations affect your assessment of painlessness.

1. Imagine you bump your shin badly on a hard edge, for example, on the edge of a glass coffee table. How painful would that be for you?

   0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8 ----- 9 ----- 10

2. Imagine your burn your tongue on a very hot drink.

   0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8 ----- 9 ----- 10

3. Imagine your muscles are slightly sore as the result of physical activity.

   0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8 ----- 9 ----- 10

4. Imagine you trap your finger in a drawer.

   0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8 ----- 9 ----- 10

5. Imagine you take a shower with lukewarm water.

   0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8 ----- 9 ----- 10
6. Imagine you have a mild sunburn on your shoulders.
   
7. Imagine you grazed your knee falling off your bicycle.
   
8. Imagine you accidentally bite your tongue or cheek badly while eating.
   
9. Imagine walking across a cool tiled floor with bare feet.
   
10. Imagine you have a minor cut on your finger and inadvertently get lemon juice in the wound.
   
11. Imagine you prick your fingertip on the thorn of a rose.
   
12. Imagine you stick your bare hands in the snow for a couple of minutes or bring your hands in contact with snow for some time, for example, while making snowballs.
   
13. Imagine you shake hands with someone who has a normal grip.
   
14. Imagine you shake hands with someone who has a very strong grip.
   
15. Imagine you pick up a hot pot by inadvertently grabbing its equally hot handles.
16. Imagine you are wearing sandals and someone with heavy boots steps on your foot.

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8 ----- 9 ----- 10

17. Imagine you bump your elbow on the edge of a table ("funny bone").

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8 ----- 9 ----- 10
APPENDIX K

PANAS (Watson & Clark, 1994)

This scale consists of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you have felt this way during the past week. Use the following scale to record your answers:

1 – Very slightly or not at all
2 – A little
3 – Moderately
4 – Quite a lot
5 – Extremely

_____ cheerful  _____ delighted
_____ disgusted  _____ inspired
_____ attentive  _____ fearless
_____ bashful  _____ disgusted with self
_____ sluggish  _____ sad
_____ daring  _____ calm
_____ surprised  _____ afraid
_____ strong  _____ tired
_____ scornful  _____ amazed
_____ relaxed  _____ shaky
_____ irritable  _____ happy
APPENDIX L

DEMOGRAPHICS

1. Age: _______ 2: Gender: _________

3. What is your classification at USM?
   a) Freshman  b) Sophomore  c) Junior  d) Senior  e) Graduate

4. What is your major at USM? ________________________

5. Please indicate your race:
   a) Caucasian  b) African American  c) Hispanic  d) Asian  
   e) Other (please specify)

6. What is your current marital status?
   a) Single, never married  b) Married  c) Divorced  d) Separated  
   e) Widowed  f) Domestic Partnership

7. Are you Left-Handed, Right-Handed, or Ambidextrous?
   _____ Left-Handed  _____ Right-Handed  _____ Ambidextrous

8. Have you recently (within the past 2 weeks) taken an antidepressant medication? (e.g., Prozac, Zoloft, Paxil, Effexor)
   _____ Yes  _____ No

9. Within the past 24 hours have you taken any over-the-counter or prescription medications for pain relief (e.g., aspirin, ibuprofen, naproxen, Lortab, Vicodin)?
   _____ Yes  _____ No
10. Have you taken any other medications for pain relief today?
   _____ Yes   _____ No

11. Do you smoke cigarettes regularly?
   _____ Yes   _____ No

   If you marked “Yes,” please indicate approximately how many cigarettes per day
   you smoke: _____________________

12. Have you ever suffered frostbite?
   _____ Yes   _____ No

13. Are you suffering from any painful conditions that affect your right hand or arm?
   (This may include arthritis, fibromyalgia, injury of the arm or hand, etc.; but, only
   mark “yes” if the condition causes pain in the right hand or arm).
   _____ Yes   _____ No

14. Have you ever been diagnosed with Raynaud’s Disease?
   _____ Yes   _____ No

15. Raynaud’s Disease is a condition marked by the following symptoms:

   Sudden and noticeable change in coloration of your fingers (whiteness followed
   by blueness) accompanied by numbness and/or pain in the fingers. These
   symptoms may be triggered by stressful situations or cold temperatures.

   Have you experienced these symptoms?
   _____ Yes   _____ No

16. Are there any cuts or other wounds on your right hand or arm?
   _____ Yes   _____ No
17. Do you suffer from any chronic pain conditions that have persisted for over 6 months?

   ______ Yes   ______ No

   If “yes,” please describe: ________________________________________________

18. Have you been diagnosed with a cardiovascular disorder?

   ______ Yes   ______ No

19. Have you ever fainted, lost consciousness, or experienced a seizure?

   ______ Yes   ______ No

20. If you have any chronic medical conditions that have not yet been mentioned, please indicate these:

   ________________________________________________
APPENDIX M

ONLINE CONSENT FORM

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

AUTHORIZATION TO PARTICIPATE IN RESEARCH PROJECT

Consent is hereby given to participate in the study titled:

Emotion and Pain Perception

1. **Purpose:** The purpose of this study is to investigate the association between an individual's emotional state as well as dissociative symptoms in the experience of pain with self-induced painful behaviors (e.g., non-suicidal self-injury, or NSSI). The results of this study will assist psychologists in better understanding the reasons individuals engage in these behaviors and potentially contribute to interventions designed to decrease and eliminate use of these behaviors.

2. **Description of Study:** The total time required of participants for this study will be approximately 1.5 hours and will require completion of self-report measures online. Some individuals may be eligible to participate in a second, in-person experimental session, and those individuals interested in participating will be given an opportunity to indicate that they would like to be considered for participation at the end of the questionnaire portion.

3. **Benefits:** Participation in this study will take approximately 1.5 hours for the online portion. Therefore, participants will be awarded 3 research credits, in accordance with the Psychology Department subject pool guidelines. It is also anticipated that participation
will aid participants in becoming more familiar with the procedures of psychological research. There is no evidence that being asked about NSSI and/or suicidal ideation and behavior results in an increase in urge to self-injure or in general suicide risk, rather there is evidence of the opposite - that being asked about urge to self-injure or suicidal thoughts/behaviors reduces the risk of engaging in these behaviors (Gould et al., 2005).

Other than that, this study will offer no tangible benefits or compensation. Students in Introductory Psychology courses may also obtain their required experimental research credits by either participating in other psychological studies advertised on the SONA site and/or writing summaries of psychology journal articles, in the manner specified in the syllabus for the Introductory Psychology course.

4. Risks: Some of the test questions involve feelings of anxiety and depression and some participants may experience mild discomfort as a result of thinking about them. Otherwise, participants will be exposed to no risks, physical, psychological, and/or social, as a result of participation in the current project. A number of procedures will be implemented to minimize the likelihood of risks to participants during the study. Participants will be provided with phone numbers for counseling services during the informed consent process in the event the experience distress as a result of the questions. Further, the participants can contact the experimenter, who has experience in the assessment and treatment of suicide risk, to discuss a referral for counseling. Participants can choose to skip any question they do not feel comfortable answering, without losing any experimental credit. In addition, if a participant becomes so uncomfortable as to
desire to discontinue participation, they may do so without losing any experimental credit.

5. **Confidentiality:** Each participant will answer five informal, non-descript questions in such a way that their responses will constitute a unique code. As such, no personally identifying information will be acquired beyond the informed consent, which will not be filed with the participants’ responses. For those participants who are eligible and wish to complete the second, in-person session of the study, their responses in that session will be matched to online measures using their unique 5-digit code.

6. **Alternative Procedures:** Students in Introductory Psychology courses may also obtain their required experimental research credits by either participating in other psychological studies advertised on the SONA site and/or writing summaries of psychology journal articles, in the manner specified in the syllabus for the Introductory Psychology course.

7. **Participant's Assurance:** Whereas no assurance can be made concerning results that may be obtained (since results from investigational studies cannot be predicted) the researcher will take every precaution consistent with the best scientific practice. Participation in this project is completely voluntary, and participants may withdraw from this study at any time without penalty, prejudice, or loss of benefits. Questions concerning the research should be directed Eileen Todd, M.A. at (315)592-8756 or Bradley Green, Ph.D. at (601)266-4589. This project and this consent form have been reviewed by the Institutional Review Board, which ensures that research projects
involving human subjects follow federal regulations. Any questions or concerns about rights as a research participant should be directed to the Chair of the Institutional Review Board, The University of Southern Mississippi, 118 College Drive #5147, Hattiesburg, MS 39406-0001, (601) 266-6820. A copy of this form will be given to the participant upon request by contacting the researcher by phone or email.

8. **Signatures:** By clicking “Agree” I consent to participating in the current study. Should you have questions about the study or your rights as a participant, please contact the researcher by phone or email before agreeing to participate.
APPENDIX N
LABORATORY CONSENT FORM

THE UNIVERSITY OF SOUTHERN MISSISSIPPI
AUTHORIZATION TO PARTICIPATE IN RESEARCH PROJECT

Consent is hereby given to participate in the study titled:

Emotion and Pain Perception

1. **Purpose:** The purpose of this study is to investigate the association between an individual's emotional state as well as dissociative symptoms in the experience of pain with self-induced painful behaviors (e.g., non-suicidal self-injury, or NSSI). The results of this study will assist psychologists in better understanding the reasons individuals engage in these behaviors and potentially contribute to interventions designed to decrease and eliminate use of these behaviors.

2. **Description of Study:** The total time required of participants for this study will be approximately 2 hours and will require two sessions, with one session consisting of completion of self-report measures online, and one in-laboratory session consisting of the Cold Pressor Task (a commonly used research pain paradigm) completion of self-report measures and debriefing.

3. **Benefits:** Participation in this study will take approximately 2 hours (1.5 hours for the online portion .5 hours for the in-laboratory portion). Therefore, participants will be awarded 4 research credits, in accordance with the Psychology Department subject pool guidelines. It is also anticipated that participation will aid participants in becoming more
familiar with the procedures of psychological research. There is no evidence that being asked about NSSI and/or suicidal ideation and behavior results in an increase in urge to self-injure or in general suicide risk, rather there is evidence of the opposite - that being asked about urge to self-injure or suicidal thoughts/behaviors reduces the risk of engaging in these behaviors (Gould et al., 2005).

Other than that, this study will offer no tangible benefits or compensation. Students in Introductory Psychology courses may also obtain their required experimental research credits by either participating in other psychological studies advertised on the SONA site and/or writing summaries of psychology journal articles, in the manner specified in the syllabus for the Introductory Psychology course.

4. **Risks:** Some of the test questions involve feelings of anxiety and depression and some participants may experience mild discomfort as a result of thinking about them. Additionally, although the pain paradigm is not considered dangerous, it does involve the intentional experience of discomfort, which may be distressing to some participants; however, the nature of the task involves the ability to quit the tasks at any time. Otherwise, participants will be exposed to no risks, physical, psychological, and/or social, as a result of participation in the current project. A number of procedures will be implemented to minimize the likelihood of risks to participants during the study. Participants will be provided with phone numbers for counseling services during the informed consent process in the event the experience distress as a result of the questions. Further, the participants can contact the experimenter, who has experience in the
assessment and treatment of suicide risk, to discuss a referral for counseling. Participants can choose to skip any question they do not feel comfortable answering, without losing any experimental credit. In addition, if a participant becomes so uncomfortable as to desire to discontinue participation, they may do so without losing any experimental credit. Because we will be asking participants about questions that are relevant to levels of imminent risk for suicidal behavior, we will implement a safety protocol geared to ensure that participants in need of help are provided with an appropriate level of care.

5. **Confidentiality:** Each participant will answer five informal, non-descript questions in such a way that their responses will constitute a unique code, which will be used on all data collected in the laboratory (such as paper copies of self-report measures, and the researcher’s notes regarding the cold pressor task), as well as to match data with the previously completed online measures. Data that is not automatically entered into a computer will be stored in a filing cabinet in the researcher’s office, and will also be coded and entered into a password protected computer file. Data that is automatically entered into a laptop computer will be saved in the same password protected computer file.

6. **Alternative Procedures:** Students in Introductory Psychology courses may also obtain their required experimental research credits by either participating in other psychological studies advertised on the SONA site and/or writing summaries of psychology journal articles, in the manner specified in the syllabus for the Introductory Psychology course.
7. **Participant's Assurance:** Whereas no assurance can be made concerning results that may be obtained (since results from investigational studies cannot be predicted) the researcher will take every precaution consistent with the best scientific practice.

Participation in this project is completely voluntary, and participants may withdraw from this study at any time without penalty, prejudice, or loss of benefits. Questions concerning the research should be directed Eileen Todd, M.A. at (315)592-8756 or Bradley Green, Ph.D. at (601)266-4589. This project and this consent form have been reviewed by the Institutional Review Board, which ensures that research projects involving human subjects follow federal regulations. Any questions or concerns about rights as a research participant should be directed to the Chair of the Institutional Review Board, The University of Southern Mississippi, 118 College Drive #5147, Hattiesburg, MS 39406-0001, (601) 266-6820. A copy of this form will be given to the participant.

8. **Signatures:** In conformance with the federal guidelines, the signature of the participant must appear on all written consent documents. The University also requires that the date and the signature of the person explaining the study to the subject appear on the consent form.

______________________________  _______________________
Signature of participant               Date

______________________________  _______________________
Signature of person explaining the study      Date
APPENDIX O

INSTITUTIONAL REVIEW BOARD NOTICE OF COMMITTEE ACTION

INSTITUTIONAL REVIEW BOARD
115 College Drive #5147 | Hattiesburg, MS 39406-0001
Phone: 601.266.6520 | Fax: 601.266.4377 | www.usm.edu/irb

NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the “Adverse Effect Report Form”.
- If approved, the maximum period of approval is limited to twelve months. Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: 13051406
PROJECT TITLE: Emotion and Pain Perception
PROJECT TYPE: Dissertation
RESEARCHER(S): Rita Eileen Todd
COLLEGE/DIVISION: College of Education and Psychology
DEPARTMENT: Psychology
FUNDING AGENCY/SPONSOR: N/A
IRB COMMITTEE ACTION: Expedited Review Approval
PERIOD OF APPROVAL: 08/21/2013 to 08/20/214

Lawrence A. Hosman, Ph.D.
Institutional Review Board
NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
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- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the 'Adverse Effect Report Form'.
- If approved, the maximum period of approval is limited to twelve months. Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: CH13051406
PROJECT TITLE: Emotion and Pain Perception
PROJECT TYPE: Change to a Previously Approved Project
RESEARCHER(S): Rita Eileen Todd
COLLEGE/DIVISION: College of Education and Psychology
DEPARTMENT: Psychology
FUNDING AGENCY/SPONSOR: N/A
IRB COMMITTEE ACTION: Expedited Review Approval
PERIOD OF APPROVAL: 01/08/2014 to 01/07/2015

Lawrence A. Hosman, Ph.D.
Institutional Review Board
REFERENCES


Schmahl, C., Bohus, M., Esposito, F., Treede, R. D., Di Salle, F., Greffrath, W.,
Ludäsch, P., Jochims, A., Lieb, K., Scheffler, K., Hennig, J., & Seifritz, E.
*Archives of General Psychiatry, 63*, 659-667.


indirect non-suicidal self-injury: An empirical test of Joiner’s interpersonal

Confirmatory factor analysis of single and multiple-factor competing models of
the Dissociative Experiences Scale in a nonclinical sample. *Assessment, 9*, 94-106.


Guidelines for the cold pressor task as an experimental pain stimulus for use with


