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Thresholds and tolerance of physical pain among young adults who engage in self-injury

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Thresholds and Tolerance of Physical Pain among Young Adults Who Engage In Self-Injury

Katrina McCoy

THESIS

submitted to the Eberly College of Arts and Sciences
at West Virginia University
in partial fulfillment of the requirements for the degree of

Master of Science
in
Psychology

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ABSTRACT

Thresholds and Tolerance of Physical Pain among Young Adults Who Engage in Self-Injury

Katrina McCoy

Prevalence rates of non-suicidal self-injury among college students ranges from 17% to 38%. Research indicates that individuals with borderline personality disorder (BPD) who self-injure sometimes report an absence of pain during self-injury. Furthermore, self-injury in the absence of pain has been associated with more frequent suicide attempts. The present study examined pain thresholds and tolerance among 44 college students (11 self-injurious and 33 non-self-injurious). Pain thresholds and tolerance were measured using an algometer pressure device which has been used to produce pain previous laboratory research. Self-injurious participants had higher pain tolerances than those who do not engage in self-injury. In addition, self-injurious participants rated the pain as less intense than participants who did not engage in self-injury. Analyses of covariance (ANCOVAs) revealed that depression and fear of pain were associated with pain tolerance and pain rating.

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Thresholds and Tolerance of Physical Pain in Self-Injurious and Non Self-Injurious Young Adults

Definition and Prevalence Rates of Self-Injury

Self-injury is defined as the intentional destruction of body tissue in the absence of a desire for death that is not culturally or socially sanctioned. Behaviors commonly included under the rubric of non-suicidal self-harm are cutting, burning, banging body parts and needle sticking (Klonsky, 2007). Tattoos and body piercing are culturally sanctioned and are therefore not typically described as self-injury. Self-injury as it is used here also excludes the stereotypic self-injury that is typically associated with pervasive developmental disorders such as mental retardation and autism (e.g., head banging). Other terms used to refer to self-injury include deliberate self-injury (Klonsky, 2007), deliberate self-harm (Gratz, 2003), and self-mutilation (Nock & Prinstein, 2004; 2005). The term non-suicidal self-injury (NSSI) is often used to distinguish between self-injury intended to cause death and self-injury that is not intended to cause death (Klonsky, 2007).

Self-injury is an increasingly prevalent public health problem. The prevalence of self-injury has been estimated at 4% among the general adult population (Briere & Gil, 1998) and approximately 14% for adolescents (Ross & Heath, 2002). Prevalence rates of non-suicidal self-injury are even higher among college students ranging from 17% to 38% (Whitlock, Echenrode & Silverman, 2006; Gratz, Dukes, & Roemer, 2002). Research suggests that these elevated rates are increasing among adolescents and young adults (Klonsky, 2007). For example, Lloyd-Richardson, Perrine, Dieker, & Kelley (2007) found that among a community sample of adolescents (grades 9-12), 46.5% reported engaging in self-injury within the past year.

Gratz (2001) found that 35% of a sample of 150 college students had engaged in at least one episode of self-injury during their lifetime. Eighty three percent of them had self-injured more than once. Fifteen percent of them had engaged in self-injury greater than 10 times and 9% of them had engaged in self-injury more than 100 times. The two most common methods of self-injury endorsed were cutting and sticking pins, needles, or staples into the skin (14%) (Gratz, 2001). Ross and Heath (2002) examined the prevalence of self-injury among high school students and found that 13.9% of 440 participants had engaged in self-injury at least once. The authors examined frequency of self-injury among the 36% of the students who endorsed present self-injury and reported that 27.9% self-injured more than once per day while 18% had engaged in self-injury only once. Historically, cutting was the most common method of self-injury (41%), but when examining only those participants who currently self injure, the most common method was self-hitting (36.3%).

In an unpublished study by McCoy and Fremouw conducted in 2004, 31% of a sample of 200 college students had engaged in self-injury at least once during their lifetime; a result similar to Gratz (2001). The most common method reported by males was burning (44%) and by females was cutting (51.31%). In a 2006 study by Gratz, 37% of a sample of 373 college students had engaged in self-injury at least once during their lifetime. Seventy two percent of them had engaged in self-injury more than once with 17% overall having engaged in self-injury on 10 or more occasions. The most common method of self-injury among this sample was cutting (46%) and severe scratching (34%) (Gratz, 2006). Whitlock et al. (2006) found that 17% of a random sample of 2,875 college students reported engaging in self-injury at least once during their lifetime.

Classification of Self-injury

Historically, self-injury was classified according to the topography of the behavior (Favazza, 1999). Contemporaneous research classifies self-injury according to its function. Nock and Prinstein (2004) proposed a four-function model of self-injury. The four functions are positive and negative automatic reinforcement and positive and negative social reinforcement. They characterize the emotion regulation function of self-injury as automatic negative reinforcement, as it abates emotional distress. In addition, they describe a positive reinforcement function of self-injury. The positive reinforcement function of self-injury occurs when an individual engages in self-injury in order to feel something, not to stop emotional distress. Of particular interest are Nock and Prinstein's proposed social negative and social positive reinforcement. They posit that as well as functioning to regulate emotion, self-injury may function to manipulate an individual's social environment. Social negative reinforcement is said to function as a way for an individual to avoid doing something aversive (e.g., self-injury which allows an individual to miss an exam at school). They suggest that the function of self-injury is social positive reinforcement when an individual receives attention from others (e.g., peers) as a result of engaging self-injury. In order to test the four function model, Nock and Prinstein administered the Functional Assessment Self Mutilation (FASM) to 108 inpatient adolescents. The FASM is a self-report measure of the functions, frequency and methods of SIB. Results revealed that items indicating automatic reinforcement of self-injury were endorsed by up to 53% of participants and items indicating social reinforcement of self-injury were endorsed by up to 24% of participants. Thus self-injury may have different functions.

Joiner Model of Self-Injurious Behavior

One recent theory suggests that the damaging effects of self-injury exceed acute physical injury and may be cumulative, eventually leading to suicide attempts and death by suicide. Joiner (2005) proposed that self-injury and suicide share a continuum. He asserts that greater experience with self-injury leads to an increased capacity for lethal self-harm, which, when combined with perceived burdensomeness and failed belongingness, may be sufficient to facilitate a suicide attempt. Joiner argues that self-injury may function to allow an individual to “work up” to the act of suicide by habituating him or her to the feelings of fear and pain by which it would be accompanied (p.48). He indicates that a desire to die and the ability to inflict lethal self-injury upon oneself are independent of one another. Joiner describes the desensitization to the physical and psychological deterrents of self-injury as what distinguishes those individuals who desire to die by suicide from those who actually follow through. The mechanism through which Joiner proposes the capacity to inflict lethal self-harm is acquired (habituation to fear and pain) suggests that individuals who self-injure may develop a greater capacity to endure pain.

Self-Injury and Suicide

Self-injury research consistently supports an association between self-injury and suicide. Cooper, et al. (2005) estimated that suicide risk increases 50 to 100 times during the first year after an instance of self-injury and that half of those who complete suicide have histories of self-injury (Cooper et al., 2005). They examined a sample of 7,968 adults (mean age was 30 years) admitted to the emergency rooms of four hospitals in England between September 1997 and August 2001 as a result of self-injury. Fifteen percent of the sample continued to engage in self-injury during the course of the study and sixty individuals died by suicide prior to the completion

of the study. It should, however, be noted that Cooper et al. included self-poisoning (overdose) in their definition of self-injury making it a more inclusive definition than that which is the focus of the current study. When examining self-injury as it is defined in the current study, Guertin, Lloyd-Richardson, Spirito, Donaldson and Boergers (2001) found that self-injury had a 55% prevalence rate among adolescents who had attempted suicide.

Whitlock, Eckenrode, and Silverman (2006) examined the responses of 2,875 college students to an internet survey of self-injurious behavior and its correlates. They found that 17% of the sample reported engaging in self-injury at least once during their lifetime. Of those students, 75.9% endorsed suicide ideation, a plan for suicide, engaging in a suicidal gesture or making a suicide attempt within their lifetime.

Nock, Joiner, Gordon, Prinstein, and Lloyd-Richardson. (2006) found that among 89 self-injurious adolescent inpatients, 70% of them reported a history of at least one suicide attempt and 55% reported two or more suicide attempts.

Currently, the relation between suicide attempts and self-injury is not well understood. Walsh (2006) succinctly distinguishes the two according to function. He posits that while the intent of suicide is to “terminate consciousness” the intent of self-injury is to “modify consciousness” (p. 7). More specifically, Walsh asserted that most individuals self-injure to assuage overwhelming negative emotion. The modification of emotional state is central to Walsh’s definition of self-injury: “The intentional, self-effected, low-lethality bodily harm of a socially unacceptable nature, performed to reduce psychological distress” (p. 4). Thus, self-injury can be viewed as a maladaptive coping strategy and not a direct attempt to die.

Within this paradigm, Walsh, like Joiner, proposed that there is a potentially cumulative trajectory from self-injury to suicide. Instead of viewing self-injury as a gateway to suicide,

Walsh proposes that suicide may result if self-injury becomes ineffective as an individual's method of alleviating psychological distress. If an individual has previously relied on self-injury to cope with overwhelming emotion but self-injury no longer yields relief, the individual may then become hopeless and turn to suicide (Walsh, 2006).

A study by Nock and Prinstein (2005) supports Walsh's model of self-injury and suicide. They examined the differential relations of the four functions of self-injury to the clinical features with which it is associated (i.e., hopelessness and recent suicide attempts). They found that although recent suicide attempts (within 4 weeks) and hopelessness, risk factors for completed suicide, are associated with automatic negative reinforcement function of self-injury, those risk factors are not associated with social reinforcement or automatic positive reinforcement. This finding suggests that individuals who self-injure in order to assuage emotional distress are at a higher risk for eventual suicide than those who self-injure in order to communicate socially.

Emotion Regulation Model

At least seven theories have been offered to explain self-injury (Messer & Fremouw 2008). Based on the research, emotional regulation, or tension reduction, has emerged as the central model. A review by Klonsky (2007) examined the results of 18 studies yielding four findings that support the emotional regulation function of self-injury. Those four findings are: 1) self-injury is preceded by negative emotions 2) those negative emotions are assuaged and replaced with relief subsequent to self-injury 3) the typical intent of self-injury is to mollify negative emotions and 4) in laboratory analog studies, self-injury results in a decrease in negative emotion and emotional arousal (Klonsky, 2007)

Several analog laboratory studies demonstrate empirical support for the emotion regulation model of self-injury. Haines, Williams, Brain, and Wilson (1995) tested the emotion regulation model using self-injurious inmates ($n = 15$) as an experimental group and non-self-injurious inmates ($n = 11$) and college students as controls ($n = 12$). Physiological arousal was measured while participants imagined an episode of self-injury and while they imagined a control scenario (e.g., accidental injury with a kitchen knife or an argument). The pattern of arousal found for the self-injurious inmates corroborates the emotion regulation model. Participants in the experimental group experienced high physiological arousal while imaging the events preceding a self-injurious episode while arousal decreased significantly as they imagined the acute self-injury and subsequent to imagining the act.

The emergence of the emotion regulation model can be identified in a study by Russ et al. (1992). They included in the criteria for self-injury that the behavior result in "...temporary relief of dysphoric feelings" (p.502). The study examined pain perception in two groups self-injurious inpatients with borderline personality disorder (BPD), those who reported experiencing pain during self-injury ($n = 11$) and those who did not ($n = 11$), as compared with participants who had no history of self-injury or clinical diagnoses ($n = 6$). The authors used the cold pressor test as a measure of pain perception and as an analog self-injury event. The acute physical pain created by submerging the hand in 10°C (50°F) water is assumed to be an adequate proxy for self-injury. The self-injurious patients with BPD who reported not experiencing pain during self-injury experienced reductions in self-reported anxiety, depression, confusion and anger following the cold pressor test. Additionally, those participants reported significantly less sensitivity to the pain of the cold pressor test when compared to the patients with BPD who reported experiencing pain during self-injury and the control group (Russ et. al. (1992).

Pain Perception and Suicide Attempts

Other research on pain perception has examined suicidal participants. Orbach, Stein, Plagi, Dov HarEven, and Elizur (1996) compared pain perception in ER patients who were admitted for suicide attempt ($n = 33$), ER patients who were admitted as victims of an accident ($n = 24$), and a community, control sample ($n = 33$). Pain perception was measured through participants' evaluation of increasing intensity electric shocks and the number of shocks participants' were willing to endure. As hypothesized, suicidal patients endured a significantly greater number of shocks than the other groups. Interestingly, the control group endured a significantly greater number of shocks than the accident group. Furthermore, the suicidal group reported experiencing significantly less pain as a result of the shocks than the accident group or control group.

Orbach, Mikulincer, King, Cohen, and Stein (1997) conducted a similar study with adolescent inpatients. The study compared three groups: suicidal inpatient adolescents ($n = 38$), non-suicidal adolescent inpatients ($n = 29$), and non-suicidal controls ($n = 34$). Pain perception was measured using a thermal sensory analyzer, a computerized apparatus that quantitatively measures pain thresholds and tolerance. Extreme hot or cold temperatures were introduced to the participant's palm via an electric current that runs through an elastic Velcro strip. Orbach et. al. measured pain thresholds and tolerance using the extreme heat function of the sensory analyzer. The maximum temperature to which participants were exposed (whether or not they indicated that pain tolerance had been reached) was 50°C (122°F). Findings revealed significantly higher pain threshold and tolerance for the suicidal participants when compared with the other two groups.

Pain Perception and Self-Injury

Bohus et al. (2000) cited that 60% of self-injurers who have borderline personality disorder (BPD) report the absence of pain during episodes of self-injury. Their study empirically examined pain perception of 12 self-injurious inpatients with BPD compared with a control group of non-clinical participants. Pain perception was assessed using two methods: the cold pressor test and the tourniquet pain test. The cold pressor test measures superficial pain while the tourniquet pain test measures ischemic pain. The self-injurious participants with BPD reported experiencing significantly less sensitivity to both types of pain than participants in the control group. Further, the self-injurious participants reported even less sensitivity to pain while experiencing psychological distress. This study supports Joiner's assertion that individuals who self-injure may develop a greater capacity to endure pain.

Nock, et al. (2006) obtained self-reports from 89 self-injurious adolescent inpatients (23 males and 66 females) on the amount of physical pain experienced during self-injury, utilized methods of self-injury, history of self-injury, and history of suicide attempts. Counter to Joiner's theory, Nock et al., found that participants who reported less physical pain during self-injury had histories of fewer self-injurious episodes and utilized fewer methods of self-injury. Additionally, participants who experienced the absence of pain during self-injury reported twice as many past suicide attempts as participants who reported experiencing pain during self-injury.

Research on pain and self-injury has, thus far, focused exclusively on inpatient samples with borderline personality disorder, a severe clinical population. The generalizability of these findings to community samples has yet to be examined.

Other Variables

Dissociation. Self-injury has also been associated with a number of other preliminary empirical findings. For example, Gratz, Conrad, and Roemer (2002) examined the relation between dissociation, insecure attachment, emotional neglect, sexual abuse, childhood separation and self-injury in a sample of 133 college students. A hierarchical regression analysis revealed a significant correlation (.33) between dissociation as measured by self-report with the Dissociative Experiences Scale (DES) and frequency of self-injury among participants.

Depression and Anxiety. Ross and Heath (2002) explored the relation between depression, anxiety, and self-injury among a sample of 440 high school students. They found that participants who reported engaging in self-injury also reported significantly more depressive and anxiety symptoms than those who did not endorse engaging in self-injury. Sixty-four percent of participants who endorsed engaging in self-injury described feelings surrounding an episode of self-injury as "lonely" and "sad."

Hopelessness. Guertin et al. (2001) examined the cognitive, affective and behavioral symptoms of 95 adolescents who had attempted suicide. They found that participants who had a history of self-injury had significantly higher scores on the Hopelessness Scale for Children (HSC) than participants who had never engaged in self-injury.

Purpose

The purpose of the current study was to examine pain threshold and tolerance in a non-clinical sample of self-injurious college students compared with controls to determine if previous findings can be generalized from the inpatient BPD self-injurious population to a community sample.

Hypotheses

1. The first purpose of the study was to examine potential differences in pain thresholds, pain tolerance and pain ratings between college students who report engaging in self-injury and those who do not. It was hypothesized that participants who self-injure would have higher pain tolerance and thresholds and lower pain ratings than those who do not self-injure.

2. The second purpose of the study was to explore other variables associated with self-injury. Based on Gratz, Conrad, and Roemer (2002), Nock and Prinstein (2005), Nock, Joiner, Gordon, Prinstein, and Lloyd-Richardson (2006), and Ross and Heath (2002) these potentially associated variables include dissociation, depression, anxiety, hopelessness, and suicide attempts. It was hypothesized that participants who self-injure would report more frequent dissociative experiences, higher rates of depression, higher levels of hopelessness, more frequent suicide attempts and higher levels of anxiety. Based on previous literature that consistently demonstrates that self-injury often occurs in the absence of physical pain, it was also hypothesized that individuals who self-injure would report a decreased fear of pain as compared with individuals who do not self-injure,

3. The third purpose of the study was to conduct several exploratory analyses.

- a) The first was to examine potential differences between college students who report engaging in self-injury alone and those who report engaging in self-injury in a social context. It was hypothesized that participants who report engaging in self-injury alone would have higher pain tolerance and thresholds than participants who report engaging in self-injury within a social context (i.e., in the presence of others).

- b) The second exploratory analysis was to examine potential differences in pain tolerance and thresholds on the self-report measures between those participants who reported recent episodes of self-injury (within 6 months) as compared with those who reported more historical episodes of self-injury.
 - c) The third exploratory analysis was to examine differences in pain tolerance and thresholds between those participants who engaged in self-injury who are currently taking psychotropic medications and those participants who engage in self-injury who are not currently taking any psychotropic medications.
4. The last purpose of the study was to determine which variables best predict participants' membership in the self-injury or non-self-injury group.

Methods

Participants

The final sample was 44 participants; 11 who had engaged in self-injury at least once during their lifetime and 33 who had never engaged in self-injury. These participants were recruited from a larger sample of 886 students (see Procedure for more details). Participants were 81.8% female for the entire sample and for the self-injury group. The age range was 18-37 and the mean age was 20.25 (SD= 4.30). Participants were 56.8 % freshman status, 29.5% sophomore status and 11.4% junior status. One participant declined to disclose her/his class rank.

Forty two participants self-identified white or Caucasian, one participant self-identified as multiracial and one self-identified as Asian Indian. One hundred percent of the self-injury group was White. The racial composition of the sample is typical for the Mid Atlantic University from which the sample was drawn. The University IRB approved the study. All participants were from undergraduate psychology classes.

Measures

Pain Measure

Algometer. An algometer (Rainwater & McNeil, 1991) was used as the measure of pain threshold and tolerance in the selected subset of participants. The apparatus produces pain through the application of gradually increasing pressure to a portion of the participant's finger directly over the bone that is protected by little muscle or fat (i.e., the second phalanx). Participants consecutively positioned the index, middle, and ring fingers of their non-dominant hand into the algometer device. Each finger was placed between two pieces of wood and pressure was applied to the second phalanx of each finger via a dull Lucite wedge attached to a wooden platform upon which a 1750 g weight was placed. Each trial lasted a maximum of 5 minutes in order to avoid the possibility of tissue damage.

Measure 1: Pain Threshold. Participants were instructed to indicate their pain threshold (i.e., the point at which the pressure becomes painful) by touching a laminated, yellow yield sign placed next to his or her dominant hand. Pain threshold was measured according to the time interval between the start of the task and when he or she touched the yellow sign.

Measure 2: Pain Tolerance. Participants were instructed to indicate pain tolerance (i.e., the point at which the pressure becomes too painful to continue) by touching a laminated, red stop sign placed on the table next to his or her dominant hand. Pain tolerance was measured according to the interval between the start of the task and when he or she touches the red sign or until the 5-minute maximum is reached.

Self-Report Measures

Screening Measure. (See Appendix A) A 14-item self-report screening measure of sensation seeking was administered to the initial sample of 886. The screening measure was

developed by the authors of the study based on the Zuckerman Sensation Seeking Scale. The screener contained the first item of the Deliberate Self-Harm Inventory (Gratz, 2001) "I have intentionally (i.e., on purpose) cut carved or burned my wrists, arms or other areas of my body (without intending to kill myself." Answer responses were "0) never, 1) 1-4 times, 2) 5-9 times or 3) more than 10 times." This screening item was used to determine whether participants met criterion for inclusion in one of two groups: the self-injury group engaged in self-injury at least once during their lifetime and the control group never engaged in self-injury.

Demographic and Clinical History questionnaire. (See Appendix B) The demographic questionnaire is a 15-item self-report demographic questionnaire that was used to obtain the age, gender, race/ethnicity and class rank of participants. In addition, the demographic and clinical history questionnaire was designed to determine whether participants met exclusionary criteria (e.g., problems with non-dominant hand) and to obtain information about participants' history of suicide attempts, and current mental health treatment (including currently prescribed medication).

Laboratory Demographic questionnaire. (See Appendix C) The laboratory demographic questionnaire is a 8-item self-report questionnaire that was used to screen participants for inclusion in the algometer upon their arrival to the laboratory. Inclusion criteria included: age (at least 18 years), the absence of heart problems, the absence of physical problems with the non dominant hand, duration of at least 12 hours since the ingestion of any pain medication, and the absence of Raynaud's disease. With the exception of age, inclusion in the algometer task was based on these variables because they have been found to affect pain tolerance and thresholds.

Deliberate Self-Harm Inventory. The Deliberate Self-Harm Inventory (DSHI; Gratz, 2001) is a 17-item self-report measure designed to measure self-injury through items such as

"Have you ever burned yourself with a cigarette? How old were you when you did this?" Gratz (2001) found that the DSHI had sufficient test-retest reliability over a 2-4 week period (.68) with regard to discriminating between participants who engaged in self-injury and those who did not. The DSHI also had good test-retest reliability with regard to the number of self-injurious behaviors endorsed by participants (.92). The DSHI was significantly correlated with other measures of self-harm. This measure was used to more thoroughly assess participants' history of self-injury.

Dissociative Experiences Scale. The Dissociative Experiences Scale (DES; Bernstein & Putnam, 1986) is a 28-item self-report measure designed to assess the frequency and severity of dissociative experiences. Respondents are asked to indicate the frequency of such experiences using a 100-point scale. Test retest reliability of the DES has over 4 to 8 week interval yielded a correlation of .84. The convergent validity of the DES with other measures of dissociation was high (combined effect size $d = 1.05$) (Carlson & Putnam, 1993).

Beck Depression Inventory – Second Edition. The Beck Depression Inventory – Second Edition (BDI-II; Beck, Steer, & Brown, 1996) is a 21-item self-report measure developed to measure the severity of depression in individuals 13 years of age and older. Test retest reliability over a 1-week interval was .93. Convergent validity between the BDI-II and the previous version the BDI-IA was .93 (Beck, Steer, & Brown, 1996).

Beck Hopelessness Scale. The Beck Hopelessness Scale (BHS; Beck & Steer, 1993) is a 20-item self-report measure developed to measure pessimism in adults. Items are rated on a 4-point scale. Higher scores indicate greater hopelessness. Test retest reliability of the BHS over 1-week was .69. The concurrent validity of clinical ratings of hopelessness and the BHS among a general medical sample was a correlation of .74 (Beck & Steer, 1993).

Fear of Pain Questionnaire. Fear of Pain Questionnaire – III (FPQ-III; McNeil & Rainwater, 1998) is a 30-item, self-report measure which asks participants to rate their fear of various hypothetical painful experiences. Painful experiences are rated on a 5-point scale. Test retest reliability over a 3-week period had a correlation of .74 and internal consistency was demonstrated to be high ($\alpha = .92$). The study suggests that the FPQ has "good" internal-consistency suggesting adequate validity (McNeil & Rainwater, 1998, p. 401).

Visual Analog Scales. A visual analog scale (VAS) was used to measure participants' self-reports of pain intensity on a continuum ranging from zero (no pain sensation) to 100 (most intense pain sensation conceivable in the given situation).

Procedure

Eight hundred eighty-six participants were administered all of the self-report measures via West Virginia University's online SONA system, a web based survey management system for universities. Participants completed a screening measure to determine eligibility to participate in the study. Eligible participants met criterion for inclusion in one of two groups: the self-injury group engaged in self-injury at least once during their lifetime and the control group never engaged in self-injury. Students were invited via e-mail by a SONA administrator to participate in the examination of pain threshold and tolerance based on their responses to the screening item measure. Using the SONA system, invited participants signed-up for a half-hour time slot during which to complete the algometer task. The experimenter was not informed of the group to which participants belonged.

Initially, inclusion criterion for the self-injury group required participants to have engaged in self-injury 10 or more times (based on the criterion established in Gratz (2001). Because only 2.9% of the respondents met that criterion, it was broadened to include participants

with a lifetime history of self-injury in order to increase the sample size. One hundred forty eight participants reported engaging in self-injury at least once during their lifetime. All were invited to participate in the study. Only 11 participants (7.4%) participated.

Fifty eight students participated in the study. Eleven participants reported engaging in self-injury at least once during their lifetime. Forty seven participants reported never engaging in self-injury. In order to obtain more equal groups, 33 of the 47 participants were selected to match the self-injury group based on age and gender; a 3:1 ratio.

Experimenters were the PI of the study and four research assistants. Three experimenters were female and two were male. Female and male experimenters administered the algometer task protocol to approximately the same number of female and male participants. Female experimenters administered the protocol to 21 female and 3 male participants. Male experimenters administered the protocol to 15 female and 5 male participants.

Experimenters were trained to administer the algometer task protocol from a printed script (See Appendix D). Each experimenter administered the protocol without errors at least twice over a one-week interval. Experimenters also administered the protocol to at least one pilot participant prior to collecting data for the study. Experimenters always used the printed script when administering the protocol.

The algometer task took place in an office-sized conference room in the psychology department. Upon their arrival, participants were greeted by the experimenter and shown the algometer and the algometer task was briefly described to them. Prior to participation, participants were asked to read the IRB approved consent and HIPAA forms carefully. The experimenter then reviewed the forms with the participant and participants were asked to initial each page and sign. Participants were then given instructions on how to perform the algometer

task. Participants were asked to indicate that they understood the instructions before the task began. The algometer task was terminated when the participant touched the red stop sign or after 5 minutes elapsed. The task was performed for the index, the middle and the ring finger of each participant. After the termination of the algometer task, participants were debriefed as to the purpose of the study.

Results

Data Screening

In order to screen out participants who may have responded randomly to the questionnaires, participants who completed the questionnaires in less than 10 minutes were not included in the study. Nineteen participants were excluded from analyses for this reason. Four participants endorsed “decline to answer” for all survey items and were also excluded from analyses.

Rates of Self-Injury

Among the final sample of 860 participants, 144 (16.8%) reported engaging self-injury at least once during their lifetime. Ninety six (11.2%) participants reported engaging in self-injury 1-4 times, 23 (2.7%) engaged in self-injury 5-9 times and 25 (2.9%) participants reported engaging in self-injury 10 or more times. Three participants declined to report whether or not they had engaged in self-injury.

Among the final sample of 44 participants, 5 (11.4%) reported engaging in self-injury 1-4 times, 3 (6.8%) engaged in self-injury 5-9 times, and 3 (6.8%) reported engaging in self-injury 10 or more times. Overall, 25% of the final sample reported engaging in self-injury at least once during their lifetime.

Methods of Self-Injury

The most common methods of self-injury were cutting (72.7%) severely scratching the skin to the extent that scarring or bleeding occurred (36.4%) and sticking sharp objects into the skin, not including tattoos, ear piercing, body piercing or drug use (27.3%).

Pain Tolerance and Thresholds

To test Hypothesis 1, each participant's average pain threshold, pain tolerance and pain rating across all three trials were calculated and the mean scores for each group were compared using one way analyses of variance (ANOVAs). Table 1 presents participants' average pain threshold, pain tolerance and pain rating by group across all three algometer trials. Separate ANOVAs compared pain threshold, pain tolerance and pain ratings between groups for each of the three trials.

Analyses indicated that there were significant differences in the expected direction on two of the three variables. The two groups differed significantly in average pain tolerance and average pain rating. Participants in the control group indicated that the pressure produced by the algometer was too painful to continue after an average of 44.75 seconds ($SD = 63.83$) while participants in the self-injury group did not indicate that the pressure from the algometer was too painful to continue until after an average of 109.18 seconds ($SD = 127.02$) had elapsed. Participants in the control group rated the intensity of the pain they experienced during the algometer task an average of 60.84 ($SD = 19.56$) on a scale of 0-100 while participants in the self-injury group provided a much less intense average rating of 46.51 ($SD = 21.45$).

To further examine Hypothesis 1, the mean pain threshold, pain tolerance and pain rating for each of the three trials was compared between the two groups using ANOVAs. Table 2 presents participants' pain threshold, pain tolerance and pain rating by group for each algometer

trial. Analyses revealed that there were significant differences in the expected direction for two of the three variables on one of the three trials. The two groups differed significantly in pain threshold and tolerance during Trial-1 (ring finger). During Trial-1 participants in the control group indicated that the pressure from the algometer device had become painful after an average of only 11.76 seconds ($SD = 14.34$). During that same trial, participants in the self-injury group did not indicate that the pressure from the algometer device had become painful until an average of 45.82 seconds (94.32) had elapsed. Furthermore, participants in the control group indicated that the pressure produced on the ring finger by the algometer was too painful to continue after an average of 37.76 seconds ($SD = 53.20$) while participants in the self-injury group were able to tolerate the pressure produced on the ring finger by the algometer for an average of 113.73 seconds ($SD = 134.47$) before it became too painful to continue. The groups did not differ significantly in pain thresholds and tolerance during Trials 2 and 3.

Psychological Measures

To test Hypothesis 2, the mean scores for each group on the five psychological measures were compared using ANOVAs. Table 3 presents participants' mean scores on the psychological measures by group. Results indicated that the groups differed significantly in the expected direction on two of the five measures. The two groups obtained significantly different scores on the BDI-II and the BHS. The control group obtained an average score of 9.03 ($SD = 8.32$) on the BDI-II while the self-injury group scored an average of 19.18 (13.00). Similarly, the control group obtained an average score of 1.85 ($SD = 1.66$) on the BHS while the self-injury group scored an average of 5.09 ($SD = 4.66$).

In order to control for potential effects of the psychological variables on pain tolerance, pain threshold, and pain rating, Analyses of Covariance (ANCOVAs) were used to compare the

two groups on average tolerance, average pain rating, and threshold and tolerance during the first trial while controlling for the effects of each psychological variable.

Tables 4 -8 present participants' adjusted mean scores on the significant pain threshold, pain tolerance and pain rating variables while covarying for scores on each psychological measure. When controlling for scores on the BDI-II, analyses indicate that although the difference in average tolerance and tolerance during the first trial is still significant, the average pain rating and threshold during the first trial are no longer significantly different.

When controlling for scores on the BHS, there is still a significant difference between groups on all variables except threshold during the first trial. Similar results were revealed when controlling for scores on the ASI and scores on the DES. When controlling for scores on the FPQ, analyses revealed that only tolerance during the first trial is still significantly difference between the two groups. Thus, the psychological variables were found to play a role in the relations between self-injury and pain rating and self-injury and pain tolerance.

Suicide Attempts. Two participants in the self-injury group reported a previous suicide attempt, 5 participants reported that they had never attempted suicide and 4 participants declined to provide information about prior suicide attempts. Analyses confirm the hypothesis that participants who self-injure would report more frequent suicide attempts, $F(1, 43) = 7.00, p = .01$.

Correlations

Table 9 presents the intercorrelations between all variables. Analyses indicate that average pain threshold was negatively associated with pain rating and scores on the FPQ. Average pain tolerance was also negatively associated with average pain rating.

Exploratory Analyses

Alone versus Social. Table 10 presents the descriptive statistics for participants who reported engaging in self-injury alone, with others and both alone and with others. Eight of the 11 participants in the self-injury group reported that they engaged in self-injury alone. Two participants endorsed engaging in self-injury with others and 1 participant reported that he or she engaged in self-injury both alone and with others. Interestingly, both participants who reported engaging in self-injury with others continued the algometer task for the maximum 5-minute duration without indicating that the pressure was so painful that they wanted to stop. The individuals who engaged in self-injury alone indicated that the pressure was so painful that they wanted to stop after an average of 70.87 seconds. Because of the small number of participants and drastically unequal groups, it was not possible to statistically test whether or not participants who report engaging in self-injury alone had higher pain tolerance and thresholds than participants who report engaging in self-injury with others.

Recent versus Historical. Table 11 presents the descriptive statistics for participants who reported engaging in self-injury recently (within the last 6 months) and historically (longer than 6 months ago). Seven of the 11 participants in the self-injury group reported engaging in self-injury within the last year. Four participants reported engaging in self-injury within the last 6 months. Because of the small number of participants, it was not possible to statistically test whether or not participants who reported engaging in self-injury within the last 6 months had higher pain tolerance and thresholds than participants who reported engaging in self-injury within the past year.

Psychotropic Medication. Table 11 presents the descriptive statistics for participants who reported that they were currently being prescribed psychotropic medication compared with those

who were not. Three of the 11 participants in the self-injury group reported that they were currently being prescribed psychotropic medication. Because of the small number of participants, it was not possible to statistically analyze whether or not participants who were currently taking psychotropic medications had significantly different pain tolerances and thresholds from participants who were not taking psychotropic medication.

Logistic Regression

Table 12 presents a summary of the logistic regression conducted to determine which variable(s) best predicts participants' membership in the self-injury or non-self-injury group. Due to a limited sample size, the number of predictors included in the model was limited to three. Predictors were chosen for inclusion based on theoretical support. Scores on the BHS were included based on the potency of hopelessness as a predictor of suicidal behavior which is associated with self-injury and the absence of pain during self-injury. Scores on the BDI were not included because it's strong correlation with scores on the BHS ($r = .79$). Similarly, average pain threshold and average pain tolerance were not both included in the model because of the strong correlation between them ($r = .58$). The inclusion of pain tolerance is supported by Joiner's theory that individuals who self-injure may acquire become desensitized to the physical and psychological deterrents of self-injury. The inclusion of average pain rating is supported by previous research indicating that individuals who self-injure report less sensitivity to pain.

The model was significant ($\chi^2 = 15.92$ (3, $N = 44$), $p = .001$) and correctly classified 97% of participants who did not engage in self-injury and 45.5% of participants who did engage in self-injury. Scores on the BHS emerged as a uniquely significant predictor of participants' membership in the self-injury group.

Post Hoc Analyses

Post hoc analyses were conducted in order to examine potential differences among individuals who participated in the algometer task and those who were invited to participate and did not. Table 13 presents mean scores on the psychological measures among participants who self-injured who participated in the algometer task and those who did not. Analyses did not reveal any significant differences on the psychological measures between individuals who self-injured who participated in the algometer task and those who did not. Table 14 presents mean scores on the psychological measures among participants who did not self-injure who participated in the algometer task and those who did not participate in the algometer task. Analyses revealed that participants who did not self-injure who participated in the algometer task scored significantly higher on the FPQ-III than participants who did not self-injure who did not participate in the algometer task.

Discussion

Major Findings/Limitations

Self-injury is a perplexing phenomenon and an increasingly prevalent public health problem. Although rates of self-injury are high among college populations, previous studies examining pain perception and self-injury have focused exclusively on inpatient samples with BPD (Whitlock, et al, 2006). The current study extends previous findings to a community sample of college students.

The prevalence rate of self-injury among the overall sample of 886 (16.8%) is similar to rates typically found among this population (Whitlock, et al, 2006; Gratz, et al, 2002).

As hypothesized, participants who reported engaging in self-injury had significantly higher pain tolerance than participants who did not engage in self-injury. Similarly, participants who engaged in self-injury rated the pain as significantly less intense than participants who did not engage in self-injury. These findings support and extend previous research that has focused exclusively on inpatients and individuals with BPD (Bohus et al., 2000; Russ et al. 1992). Additionally, these findings are consistent with Joiner's (2005) theory that individuals who self-injure may have an increased capacity to endure pain. It is notable that when examining pain tolerance by trial, the groups were only significantly different during Trial 1. After the first trial, the two groups performed more similarly with the self-injurious participants demonstrating lower tolerance and thresholds and the non self-injurious participants demonstrating generally higher tolerance and thresholds. Both groups' pain ratings increased across the three trials.

Interestingly, there was not a significant difference in average pain thresholds between the two groups. Participants who self-injured perceived the pressure as painful just as quickly as participants who did not self-injure, but were able to tolerate the pain for longer. The absence of this finding may be a result of inadequate power, particularly since there was a significant difference between the groups for threshold during the first trial (ring finger). It should be noted that the small sample of self-injurious participants examined in this study ($n = 11$) is comparable with the samples examined in previous research examining pain thresholds and tolerance among patients with BPD. Russ et al. (1992) examined pain perception among 11 participants with BPD who self-injured and Bohus et al. (2000) examined pain perception among 12 participants with BPD who self-injured.

Analyses revealed that some of the differences in pain tolerance and pain ratings may have been influenced by psychological variables. When pain tolerance, thresholds and pain

ratings were compared while controlling for depression, there was no longer a significant difference in average pain rating between the groups. Thus, depression may play a role in the relation between self-injury and average pain rating.

Similarly, when controlling for fear of pain, there was no longer a significant difference in average pain tolerance or average pain rating between the two groups. These findings suggest that fear of pain may play a role in the relations between self-injury and average pain rating and self-injury and average tolerance.

Among this sample, participants who engaged in self-injury scored significantly higher on the BDI-II and than participants who did not engage in self-injury. In fact, the self-injurious participants scored within the clinical range on the BDI-II whereas the non self-injurious participants did not score within the clinical range. This finding supports previous research by Ross and Heath (2002) that participants who engaged in self-injury demonstrated significantly more depressive symptomology than participants who did not engage in self-injury. Participants who engaged in self-injury also scored significantly higher on the BHS than participants who did not engage in self-injury. This finding corroborates and extends previous findings that adolescents with previous suicide attempts who self-injured scored higher on a measure of hopelessness than adolescents with previous suicide attempts who did not self-injure (Guertin et al., 2001).

The present study did not support previous findings that participants who engaged in self-injury scored higher on measures of anxiety. In fact, the self-injurious and non self-injurious participants scored similarly on the ASI. Both groups scored similarly to non-clinical samples. Likewise, results of this study were not consistent with Gratz, et al.'s (2002) finding that dissociation was associated with self-injury. Self-injurious participants and non self-injurious

participants obtained similar scores on the DES. Their scores are consistent with the established norms for students.

Failure to observe some of the hypothesized differences between the two groups may have been due to limited power resulting from the small sample size. Among the statistically significant findings, effect sizes were relatively low. Future studies should replicate findings among a larger sample. Given the dramatic difference in pain tolerance observed between participants who engaged in self-injury alone and those who engaged in self-injury in a social context, studies with larger samples should examine whether the social context of self-injury is associated with pain tolerances and thresholds. In addition, studies with larger samples should examine whether recent versus historical self-injury or taking psychotropic medication is associated with pain tolerances and thresholds among self-injurious individuals.

Since rates of self-injury are high among college students it is important to examine self-injury and its sequel among that population. However, no study to date has examined pain thresholds and tolerances among a community samples. Studies should replicate findings among more diverse community samples, particularly adolescents among whom the highest rates of self-injury have been reported (Lloyd-Richardson, et al., 2007).

In addition, results from the present study suggest that depression and fear of pain may play a role in the relation between self-injury and pain tolerance and the relation between self-injury and pain rating. Future studies should examine potential mediating or moderating effects of depression and fear of pain on the relation between self-injury and pain perception.

Implications

Overall, the current study contributes to the literature examining pain perception among individuals who engage in self-injury. It supports findings that some individuals who self-injure

may do so with an increased capacity to endure pain or in the absence of pain (Russ et al., 1992; Bohus et al., 2000).). Previous findings suggest that the absence of pain during self-injury is associated with more frequent suicide attempts (Nock et al., 2006). The literature suggests one possible explanation for the relation between self-injury in the absence of pain and suicidal behavior. Previous research demonstrates that individuals who engage in self-injury in the absence of pain are more likely to utilize self-injury in order to alleviate negative affect (Russ et al., 1992). A growing body of literature suggests that individuals who engage in self-injury with the intent to alleviate negative affect are at an increased risk for suicide as compared with individuals who engage in self-injury for other reasons (Nock & Prinstein, 2005; Glenn & Klonsky, under review). A possible explanation for the relation between self-injury intended to alleviate negative affect and suicide is Walsh's (2006) theory. Self-injury that is relied upon to alleviate negative affect may become an ineffective means for relieving distress. In this case, an individual accustomed to relying upon self-injury to alleviate negative affect may become hopeless and desire to die by suicide. Another possibility is that an individual accustomed to relying on self-injury to alleviate negative affect may engage in more extreme forms self-injurious behavior should his/her typical method of self-injury become ineffective for its intended purpose. This more extreme self-injury may become lethal. Although previous research suggests that there is a relation between pain perception during self-injury, emotion regulation and suicide, that relation is not well understood. Therefore, future studies should examine the relation between those variables.

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Table 1

Average Pain Tolerance, Threshold and Ratings by Group

	<u>Control (n = 33)</u>		<u>Self-Injury (n = 11)</u>		<i>F</i> (1, 42)	<i>d</i> ²
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Threshold	13.99	19.41	41.30	87.95	2.89	.06
Tolerance	44.75	63.83	109.18	127.02	4.93*	.11
Pain Rating	60.84	19.56	46.51	21.45	4.22*	.09

Thresholds and tolerance in seconds

* $p < .05$.

Table 2

Pain Tolerance, Threshold, and Rating by Trial

	<u>Control (n =33)</u>		<u>Self-Injury (n = 11)</u>		<i>F</i> (1,42)	<i>d</i> ²
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Threshold 1	11.76	14.34	45.82	94.32	4.21*	.09
Threshold 2	15.76	25.75	37.91	87.19	1.75	.04
Threshold 3	14.48	20.18	37.73	87.59	2.09	.05
Tolerance 1	37.76	53.20	113.73	134.47	7.37*	.15
Tolerance 2	49.97	77.61	104.27	127.43	2.88	.06
Tolerance 3	47.61	74.12	102.18	128.99	3.02	.07
Pain Rating 1	58.55	21.11	48.64	21.69	1.80	.04
Pain Rating 2	60.76	18.96	49.55	26.78	2.33	.05
Pain Rating 3	63.24	21.77	56.36	25.01	.77	.02

1 = ring finger, 2 = middle finger, 3 = index finger
 Threshold and tolerance in seconds

* $p < .05$.

Table 3

Psychological Measures by Group

	<u>Control (n = 33)</u>		<u>Self-Injury (n = 11)</u>		<i>F</i> (1, 42)	<i>d</i> ²
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
BDI-II	9.03	8.32	19.18	13.00	9.15**	.18
BHS	1.85	1.66	5.09	4.66	11.94**	.22
ASI	18.24	7.29	16.45	10.67	.39	.01
FPQ	80.73	15.42	73.09	16.86	1.93	.04
DES	13.84	9.39	16.01	14.34	.33	.01

***p* < .01.

Table 4

Pain Tolerance, Threshold and Ratings Covaried for BDI-II Score

	<u>Control (n = 33)</u>		<u>Self-Injury (n = 11)</u>		<i>F</i> (1, 42)	<i>d</i> ²
	<i>Adj. M</i>	<i>Std. E</i>	<i>Adj. M</i>	<i>Std. E</i>		
Tolerance	42.98	15.03	114.49	27.34	4.90*	.11
Threshold	13.06	8.32	44.10	15.14	3.01	.01
Pain Rating	60.71	3.62	46.91	6.59	3.15	.07
Threshold 1	11.67	8.63	46.09	15.70	3.44	.08
Tolerance 1	38.53	14.53	111.42	26.44	5.45*	.12

Threshold and tolerance in seconds

**p* < .05.

Table 5

Pain Tolerance, Threshold and Ratings Covaried for BHS Score

	<u>Control (n = 33)</u>		<u>Self-Injury (n = 11)</u>			
	<i>Adj. M</i>	<i>Std. E</i>	<i>Adj. M</i>	<i>Std. E</i>	<i>F</i> (1, 42)	<i>d</i> ²
Tolerance	41.78	15.09	118.13	27.81	5.34*	.12
Threshold	13.20	8.40	43.67	15.48	2.74	.06
Pain Rating	61.35	3.64	44.99	6.71	4.22*	.09
Threshold 1	12.80	8.67	42.69	15.99	2.48	.06
Tolerance 1	37.94	14.66	113.19	27.02	5.50*	.12

Thresholds and tolerance in seconds

**p* < .05.

Table 6

Pain Tolerance, Threshold and Ratings Covaried for ASI Score

	<u>Control (n = 33)</u>		<u>Self-Injury (n = 11)</u>			
	<i>Adj. M</i>	<i>Std. E</i>	<i>Adj. M</i>	<i>Std. E</i>	<i>F</i> (1, 42)	<i>d</i> ²
Tolerance	44.10	14.55	111.15	25.25	5.28*	.11
Threshold	14.29	8.08	40.40	14.03	2.59	.06
Pain Rating	60.91	3.53	46.30	6.12	4.26*	.09
Threshold 1	11.96	8.39	45.22	14.56	3.91	.09
Tolerance 1	36.67	13.73	117.00	23.84	8.50**	.17

Thresholds and tolerance in seconds

p* < .05., *p* < .01.

Table 7

Pain Tolerance, Threshold and Ratings Covaried for FPQ Score

	<u>Control (n = 33)</u>		<u>Self-Injury (n = 11)</u>			
	<i>Adj. M</i>	<i>Std. E</i>	<i>Adj. M</i>	<i>Std. E</i>	<i>F</i> (1, 42)	<i>d</i> ²
Tolerance	46.82	14.46	103.00	25.32	3.65	.08
Threshold	15.85	7.71	35.72	13.50	1.60	.04
Pain Rating	60.34	3.47	48.02	6.08	3.05	.07
Threshold 1	13.28	8.15	41.24	14.28	2.85	.07
Tolerance 1	39.14	14.10	109.58	24.70	6.04*	.13

Thresholds and tolerance in seconds

**p* < .05.

Table 8

Pain Tolerance, Threshold and Ratings Covaried for DES Score

	<u>Control (n = 33)</u>		<u>Self-Injury (n = 11)</u>			
	<i>Adj. M</i>	<i>Std. E</i>	<i>Adj. M</i>	<i>Std. E</i>	<i>F</i> (1, 42)	<i>d</i> ²
Tolerance	44.84	14.70	108.93	25.50	4.73*	.10
Threshold	14.00	8.14	41.29	14.12	2.80	.06
Pain Rating	60.98	3.50	46.10	6.07	4.50*	.10
Threshold 1	12.00	8.37	45.11	14.53	3.89	.09
Tolerance 1	38.14	14.11	112.57	24.49	6.91*	.14

Thresholds and tolerance in seconds

**p* < .05.

Table 9

Intercorrelations between Variables

	Pain Threshold	Pain Tolerance	Pain Rating	BDI-II	BHS	ASI	FPQ	DES
Pain Threshold	1	.58**	-.36*	.04	.07	-.14	-.37*	.02
Pain Tolerance		1	-.35*	.07	.05	.11	-.26	.05
Pain Rating			1	-.15	-.07	.03	.26	.10
BDI-II				1	.79**	.36*	.16	.49**
BHS					1	.20	-.10	.50**
ASI						1	.48**	.50**
FPQ							1	.13
DES								1

*p < .05., **p < .01.

Table 10.

Average Pain Tolerance, Threshold and Ratings by context of self-injury

	Alone (n = 8)		Social (n = 2)		Alone and Social (n = 1)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Threshold	16.54	22.92	154.17	206.24	13.67	0.00
Tolerance	70.87	100.80	300.00	.00	34.00	0.00
Pain Rating	47.50	22.13	35.00	25.93	61.67	0.00

Table 11

Average Pain Tolerance, Threshold, and Ratings by recency of Self-Injury and Current use of Psychotropic Medication

	Historical (n = 4)		Recent (n = 5)		Meds (n = 3)		No Meds (n = 8)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Threshold	79.67	146.92	24.13	27.14	30.44	36.00	45.37	103.01
Tolerance	161.83	159.58	104.67	118.39	150.11	141.84	93.83	127.72
Pain Rating	47.50	21.50	50.00	18.43	49.44	35.01	45.41	17.38

Table 12

Summary of Logistic Regression for Variables Predicting Inclusion in Self-Injury Group (N = 44)

Step	Variable	B	SE B	Exp (B)
1				
	BHS	.54	.24	1.71
	Tolerance	.01	.01	1.01
	Pain Rating	-.03	.02	.97

Table 13

Psychological Measures by Participation Status among Participants Who Self-Injured

	Algometer (n = 11)		No Algometer (n = 133)		<i>F</i> (1, 142)	<i>d</i> ²
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
BDI-II	19.20	13.00	16.31	12.09	.57	.00
BHS	5.09	4.66	4.11	4.12	.57	.00
ASI	16.71	10.77	19.98	11.07	.89	.01
FPQ	73.27	16.85	72.48	22.04	.01	.00
DES	16.01	14.34	21.36	16.13	1.13	.01

Table 14

Psychological Measures by Participation Status among Participants Who Did Not Self-Injure

	Algometer (n = 33)		No Algometer (n = 680)		<i>F</i> (1, 711)	<i>d</i> ²
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
BDI-II	9.09	8.30	8.61	8.92	.09	.00
BHS	1.85	1.67	2.28	2.55	.92	.00
ASI	18.27	7.32	16.87	9.56	.68	.00
FPQ	80.73	15.42	70.84	24.23	5.39*	.01
DES	13.84	9.39	15.12	13.49	.29	.00

**p* < .05.

APPENDIX A – *Sensation Seeking Scale*

Listed below are questions for this section of the survey. Please provide a response for every question. If you are given the option to decline to answer a question, then declining to answer is considered a response.

1. I sometimes do "crazy" things just for fun.

☒

True

☒

False

☐

Check this box if you do not want to provide an answer for this question

2. I sometimes like to do things that are a little frightening.

☒

True

☒

False

☐

Check this box if you do not want to provide an answer for this question

3. I occasionally drive very fast.

☒

True

☒

False

☐

Check this box if you do not want to provide an answer for this question

4. I like to explore a strange city or section of town by myself, even if it means getting lost.

☒

True

☒

False

☐

Check this box if you do not want to provide an answer for this question

5. I'll try anything once.

- ☒ True
☒ False

☐ Check this box if you do not want to provide an answer for this question

6. I occasionally get very drunk

- ☒ True
☒ False

☐ Check this box if you do not want to provide an answer for this question

7. I have driven over 90 mph.

☒	☒	☒	☒
Never	1-4 times	5-9 times	More than 10 times

☐ Check this box if you do not want to provide an answer for this question

8. I am an impulsive person.

- ☒ True
☒ False

☐ Check this box if you do not want to provide an answer for this question

9. I have intentionally (i.e., on purpose) cut, carved or burned my wrists, arms, or other areas of my body (without intending to kill myself).

☒	☒	☒	☒
Never	1-4 times	5-9 times	More than 10 times

☐ Check this box if you do not want to provide an answer for this question

10. If you have intentionally (i.e., on purpose) cut, carved or burned your wrists, arms, or other area(s) of your body (without intending to kill myself), how have you done so?

☐ Alone

☐ With others

☐ Alone and with others

☐ Check this box if you do not want to provide an answer for this question

11. I have gotten very drunk more than 10 times.

☐ True

☐ False

☐ Check this box if you do not want to provide an answer for this question

12. I have deliberately choked myself until I passed out.

☐ Never

☐ 1-4 times

☐ 5-9 times

☐ More than 10 times

☐ Check this box if you do not want to provide an answer for this question

13. If you have deliberately choked yourself until you passed out, how have you done so?

☐ Alone

☐ With others

☐ Alone and with others

☐ Check this box if you do not want to provide an answer for this question

14. I have willingly been choked by a friend until I passed out.

☐ Never

☐ 1-4 Times

☐ 5-9 times

☐ More than 10 times

APPENDIX B – *Demographic and Clinical History Questionnaire*

Listed below are questions for this section of the survey. Please provide a response for every question. If you are given the option to decline to answer a question, then declining to answer is considered a response.

1. Do you have heart problems, or have you ever had heart problems?

☐ Yes

☐ No

☐ Check this box if you do not want to provide an answer for this question

2. Are you under the age of 18 years?

☐ Yes

☐ No

☐ Check this box if you do not want to provide an answer for this question

3. Do you have any problems with the fingers on your non-dominant hand such as recent surgery, arthritis, an open wound, or any pain?

☐ Yes

☐ No

☐ Check this box if you do not want to provide an answer for this question

4. Do you have Raynaud's disease?

☐ Yes

☐ No

☐ Check this box if you do not want to provide an answer for this question

5. What is your gender?

☐ Male

☐ Female

☐ Check this box if you do not want to provide an answer for this question

6. What is your age?

☐ Check this box if you do not want to provide an answer for this question

7. What is your class rank?

- ☐ Freshman
- ☐ Sophomore
- ☐ Junior
- ☐ Senior
- ☐ Graduate

☐ Check this box if you do not want to provide an answer for this question

8. What is your race or ethnic background?

☐ Check this box if you do not want to provide an answer for this question

9. Have you ever deliberately tried to kill yourself?

- ☐ Yes
- ☐ No

☐ Check this box if you do not want to provide an answer for this question

10. If you have deliberately tried to kill yourself, how many times have you done so?

☐ Check this box if you do not want to provide an answer for this question

11. Are you currently receiving mental health services, such as therapy or counseling?

☐ Yes

☐ No

☐ Check this box if you do not want to provide an answer for this question

12. Have you EVER received mental health services, such as therapy or counseling?

☐ Yes

☐ No

☐ Check this box if you do not want to provide an answer for this question

13. If you have recieved mental health services, such as therapy or counseling, in the past, when did you do so?

☐ Check this box if you do not want to provide an answer for this question

14. Are you currently being prescribed any medications for mental health purposes (e.g., depression, anxiety etc)?

☐ Yes

☐ No

☐ Check this box if you do not want to provide an answer for this question

15. If you are you currently being prescribed any medications for mental health purposes, please list those medications.

☐ Check this box if you do not want to provide an answer for this question

APPENDIX C – *Laboratory Demographics Questionnaire*

Date _____ Participant # _____ Experimenter _____
 (Ask the following questions and record participant's answers.)

- YES NO** 1. Do you have heart problems, or have you ever had heart problems?
- YES NO** 2. Are you under the age of 18 years?
- YES NO** 3. Do you have any problems with the fingers on your non-dominant hand such as recent surgery, arthritis, an open wound, or any pain?
- YES NO** 4. Have you taken pain inhibiting drugs (such as ibuprofen, acetaminophen “Tylenol”, and aspirin) within the past 12 hours? (11 hrs ok)
- YES NO** 5. Do you have any reason to believe that you are or have been under the influence of alcohol or narcotics within the past 12 hours? (11 hrs ok)
- YES NO** 6. Do you have Raynaud’s disease?
-

Dominant Hand:

1. Right Handed 2. Left Handed 3. Ambidextrous (i.e., use both hands equally well)

Dominant Hand Preference if Ambidextrous

1. Right Hand 2. Left Hand 3. Not Applicable

The following questions are to be asked after the participant consents to participate in the study.

- 7. YES NO** 1. Are you experiencing any pain right now?
 If yes, please specify: _____
- 8. YES NO** 2. Are you taking any prescription medications right now?
 (Excluding birth control)
 If yes, please specify: _____

APPENDIX D –*Experimental Protocol*

**Thresholds and Tolerance of Physical Pain among Self-Injurious and Non-Self Injurious
College Students
Experimental Protocol**

Resources for Study:

- A. Materials: To be stored on right hand side of filing cabinet in 2nd drawer down from the top.
 - 1. Algometer Pressure Device
 - 2. Algometer weight (1,500 gram)
 - 3. Stopclock
 - 4. Several pens
 - 5. Clipboard
 - 6. Laminated red “Stop Stimulation” card
 - 7. Laminated yellow "Pressure is Painful" card
 - 8. Pain rating scale

- B. Materials: In each participant folder
 - Participant folders have participant number on tab.
 - 1. Demographics form
 - 2. Consent form (Experimenter and Participant Copies)
 - 3. PHI form (Experimenter and Participant Copies)
 - 5. Morgantown Area Mental Health Resources
 - 6. extra credit slip
 - 7. Record Sheet

- C. Appendices:
 - A. Consent Form
 - B. PHI Form
 - C. Demographics Form
 - D. Payment Acknowledgment Form
 - E. Morgantown Area Mental Health Resources
 - F. Participant and Non-participant record form
 - G. Record Sheet

Begin Experimental Procedure

Participant Screening

A. **Things you need before the participant arrives:** clipboard, participant folder, manila file folder (contains Stop Sign, Pressure is Painful Sign, Pain Rating), algometer, and weight sitting on a chair within reach of the experimenter, but pushed under the table somewhat, out of the view of the participant.

B. **When the participant arrives...**

1. While wearing appropriate attire, the experimenter should greet the participant promptly when he or she arrives, saying,

“Thank you for coming to participate in our study today. We appreciate your time and effort. My name is _____, I will be conducting the study with you. “

2. The participant should be directed to sit with his/her back to the book shelf facing the blank wall (window is on his/her left side).
3. Make sure the "Please do not disturb. Experiment in Progress" sign is securely attached to the outside of the door.
4. The experimenter will then be responsible for immediately going over the Checklist for Participant's Eligibility with the participant.

Read the following questions to the Participant and write their responses on the first page of the Demographics Form. If they say: “YES” to any of the following questions, he or she is to be excluded from participating in the experiment, unless another option has been specified.

Say: “I need to ask you a few questions to make sure you can participate in the study before we can begin. OK?”

Read 6 screening questions on demographics form.

MEETS CRITERIA: WILL PARTICIPATE

If the participant meets all of the criteria, then the experiment can continue.

Say: “Thank you, now we can proceed onto the experiment.”

DOES NOT MEET CRITERIA: WILL NOT PARTICIPATE

If not, the experimenter is to briefly describe the study and answer any questions. Then, thank them for their time and interest in the study, and lead them to the door. Say, “Thank you for taking the time to learn about our study. Although you cannot participate today because you indicated ‘yes’ to one or more of the previous questions, we encourage you to seek out other research opportunities in the psychology department.” Thank participant and lead them to the door.

Now it is appropriate for the experimenter to explain the experiment to the participant. This explanation should essentially summarize what the participant will read in the consent form.

Brief Description of Algometer and Procedures to Participants

1. Give a brief overview of the experiment to the participant, saying: “Today we will be doing a few things over the course of a half an hour. First, I will explain the experimental task. Then, we will discuss your rights as a participant. After we complete the experimental task I will ask you a few questions.

2. Remove the Algometer, weight, Stop Sign, and Pressure is Painful Sign from the chair. Say to the participant: “Which hand is your dominant hand? (Record on demographics form and then speak using participant’s specific hand for the rest of the experiment). This is an Algometer pressure device. It will be used to produce pressure on the fingers of your left/right hand (non-dominant hand) 3 times during the experiment. First, you place your left/right (non-dominant) hand here (demonstrate with your own finger), with your finger between these two small pieces of wood. These screws will be gently tightened to prevent your finger from moving (Note: Point to the screws as you say these words). Your other fingers will rest on top of the screws.”

“Next, I will put this small wooden platform over your finger. Go ahead and feel this piece of plastic that will be touching the top of your finger (let the participant feel the plastic piece). Then I will gently place the weight on the top of this. If the pressure becomes painful, touch this yellow sign with your other hand to let me know that it’s starting to hurt (point to the yellow “yield” sign). If the pressure becomes too painful and you want to stop, touch this red stop sign (point to the red “Stop” sign). If, for any reason, you wish to stop the condition, you may touch this red stop sign. When you touch the red sign, I will remove the weight. Please do not touch the weight or platform at any time, OK? You will perform this algometer trial three times today. What do you understand about the algometer?” (Make sure the participant understands the procedure and answer any questions/misconceptions they have).

3. Show VAS pain rating scale: “After each algometer trial ends, I will ask you to rate your sensations on a scale ranging from 0 to 100, where 0 = No pain and 100 = Maximum pain possible in this situation. When you rate your sensations, please rate the most intense sensations you experienced in the finger you just had in the algometer.”

“What questions do you have about the procedure just explained to you?”

4. Remove materials from table and place back on chair.

5. Provide the consent form and the PHI form to the participant with a pen. Say, “These forms are called an informed consent form and a PHI form. The informed consent form explains the study in detail and your rights concerning participation. The PHI form describes how your health information, or PHI, is protected because we are asking for certain health information, such as general medical conditions and medications used. Please read both forms carefully and then I will go over them with you. Does that sound OK?” Step away and allow the participant time to read the informed consent. OBTAIN SIGNATURE AND INITIALS WHERE APPROPRIATE AND SIGN OFF YOURSELF WHERE APPROPRIATE. Say “These blue forms are copies for you and I’ll give them to you at the end of the experiment.

PARTICIPANT DOES NOT CONSENT TO PARTICIPATE

At this point, if the participant chooses not to sign the consent form, the experimenter is to briefly describe the study and answer any questions. Then provide the participant with the extra credit and thank them for their time and interest in the study, and lead them to the door. Say, “Thank you for taking the time to learn about our study. Here is the extra credit slip you earned for your effort to participate in the study. We encourage you to seek out other research opportunities in the psychology department.” Thank participant and lead them to the door.

PARTICIPANT CONSENTS TO PARTICIPATE

If the participant decides to sign the consent form, the experimenter will provide the participant with payment and a payment acknowledgement form. Money can be found in the Orange expanding file folder in the second drawer from the top on the right side of the cabinet. Record how much money you remove for each participant as well as the time and date. The orange expanding file folder is to stay in the drawer. Do not allow the participant to see you remove money from the orange expanding file folder.

1. Say, “Here is the extra credit you earned for participating in the study. Your name will be automatically entered into the drawing to win one of four \$75 prizes.”
2. Ask questions 7 and 8 on demographics form and record answers.

Experimental Procedure

1. Remove from the chair the Algometer, "Pressure is painful sign, "Stop" sign, Rating Scale, stop watch, record sheet weight.

Then say: “The study you are participating in today may be beneficial to psychological research. Your role participating in this study is extremely valuable, and your time and effort are appreciated.”

“First, you will have the ring finger of your left/right (non-dominant) hand placed in the algometer and a weight will be placed upon it. If the pressure becomes painful, touch this yellow sign with your dominant hand to let me know that it’s starting to hurt (point to the yellow “yield” sign). When you want to stop, please touch the RED SIGN which indicates “I want to stop.” Please do not touch the weight or the algometer device at this point. I will remove the weight and the wooden platform for you.” After I have removed the weight, I will ask you to rate the pain you experienced during the algometer task before I remove the platform from your finger. I will leave the platform on your finger for 30 seconds after I have removed the weight from it to minimize potential discomfort due to increased blood flow to the part of your finger where the weight was resting, OK?

2. Place yellow “Painful” card and the red “Stop Stimulation” card near the participant’s dominant hand. The card should read from left to right. Place the participant’s non-dominant ring finger in the algometer saying:

TRIAL 1: “Now, please place the ring finger of your non-dominant hand in the algometer device.”

TRIALS 2 & 3: “Now we will repeat the procedure with your middle/forefinger. Please place the middle/forefinger of your non-dominant hand in the algometer device.

Tighten the screws to hold the finger in place, and lightly place the platform with wedge on top. The stopwatch should be in front of you and you should have the clipboard with the record sheet and a pen. The demographics form and VAS should be within reach. Turn the protocol book so you can see it.

3. Briefly remind participant to use the “Painful” and “Stop” signs and to remain quiet.

Say: " Remember, when I place the weight on the algometer touch the yellow sign if the pressure becomes painful and the red sign when you would like to stop and remain quiet during the trial and remember not to touch the weight or the platform at any time.”

4. Before placing the weight on the platform, check with the participant by asking, “Are you ready to begin?” Upon assurance from the participant (e.g., head nod), start stopwatch, place the weight on the algometer. DON’T TOUCH TABLE WHILE WEIGHT IS ON ALGOMETER. REMEMBER TO STOP TASK AFTER 5 MINUTES EVEN IF PARTICIPANT HAS NOT TOUCHED RED STOP SIGN.
5. If participant touches the yellow sign, immediately record the time elapsed on the stopwatch (in seconds). Stop stopwatch when the participant touches the red sign and remove the weight from the participant’s finger (but still leave the platform in place for 30 seconds).
6. The experimenter should now record the time indicated by the stopwatch. START TIMING FOR 1-MINUTE REST PERIOD IMMEDIATELY AFTER RECORDING STOP TIME.
7. The experimenter should show the participant the VAS and ask the participant to rate their actual pain record the rating on the data record sheets, saying “Thank you. Now, using this scale I showed you earlier, on a scale from 0 to 100, how would you rate the worst pain you

experienced during the task in the finger you had in the algometer pressure device?” [Record actual pain rating.].

8. Remove platform from participant’s finger.
9. Repeat procedure with middle and forefingers starting with step 2.

Post-experimental assessments

1. After all 3 trials are complete; remove all experimental materials from the table.
2. Thank you. Here is a list of mental health resources in the Morgantown area we give all participants because sometimes people decide that they are interested in psychological services (provide all participants with Morgantown Area Mental Health Resources Sheet).
3. Say: “Thank you again for your participation in our experiment today. Your time and effort make our research possible, and for that we are very grateful. Now I’d like to debrief you about the experiment, ok?”
 - “What did you think of our study?”
 - “What did you think about the algometer?” / “How are your fingers feeling, now?”
 - Explain that the pain and indentations are temporary. Say: “The indentations you see on your fingers will disappear in a few hours.”
 - Explain to the participants briefly what the experiment was about. Say: "This study aims to examine the potential differences in pain tolerance and thresholds among individuals who have engaged in self-injurious behavior 10 or more times as compared with individuals who have never engaged in self-injurious behavior. Because this information may influence the performance of future participants, we ask that you refrain from sharing this information with other potential participants."

4. Walk participant to the door and thank them again.

Then, prepare room and materials for the next participant. Or, if you are the last data collection of the day, return materials to proper storage place (see list of resources at beginning of protocol to determine where materials go).

5. Make sure you have recorded whether the participant participated on Participant record form.

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Education

West Virginia University
Bachelor of Arts

Morgantown, WV
May 2006

Awards, Honors, Affiliations

- ❖ **Southern Regional Educational Board Doctoral Scholars Award**, Southern Regional Educational Board, August 2006
- ❖ **Outstanding Senior**, Psychology Department-West Virginia University , May 2006
- ❖ **McNair Scholar**, McNair Scholars Program, West Virginia University, May 2004-May 2006
- ❖ **Eberly Scholar, Eberly College of Arts and Sciences Scholarship**, West Virginia University, 2005-2006
- ❖ **Fourth Place Award, Psychology Category**, 11th annual Southeastern Association of Educational Opportunity Program Personnel/University of Tennessee at Knoxville McNair National Scholars Research Conference, July 2005
- ❖ **Loyalty Permanent Endowment Fund Scholarship** Fall 2004- Spring 2008
- ❖ **National Society of Collegiate Scholars**, 2003-Present
- ❖ **Psi Chi, National Honor Society in Psychology**
- ❖ **Psychology Club**
- ❖ **Energy Express Educational Award**, Energy Express AmeriCorps, 2004
- ❖ **PEO Sisterhood Memorial Scholarship**, Lewisburg, WV Chapter, Fall 2002

Publications

Ragatz, L., Fremouw, W.J., Thomas, T., **McCoy, K.** (In press). Vicious Dogs: The Antisocial Behaviors and Psychological Characteristics of Owners. *Journal of Forensic Sciences*.

Fremouw, W. J., **McCoy, K.**, Tyner, E., & Musick, R., (In press). Suicidal older adult protocol-SOAP. In L. Vande Creek, (Ed.). *Innovations in Clinical Practice*, Sarasota, FL: Professional Resource Exchange.

Clegg, C., **McCoy, K.** & Fremouw, W. J. (In press). Rape Trauma Syndrome. In C. Edwards (Ed.), *Encyclopedia of Forensic Sciences*. New York: John Wiley & Sons, Inc.

McCoy, K. & Fremouw, W. J. (In press). Murder-Suicide. In C. Edwards (Ed.), *Encyclopedia of Forensic Sciences*. New York: John Wiley & Sons, Inc.

Walters, G. D. & **McCoy, K.** (2007) Taxometric Analysis of the Psychological Inventory of Criminal Thinking Styles in Male and Female Incarcerated Offenders and College Students. *Criminal Justice and Behavior*, 34, 781 – 793.

McCoy, K., Fremouw, W., Tyner, E., Clegg, C., Johansson-Love, J., Strunk, J. (2006). Criminal Thinking Styles and Illegal Behavior among College Students: Validation of the PICTS. *Journal of Forensic Sciences*, 51, 1174-1177.

Conference Presentations & Posters

❖ **Southeastern Psychological Association** **New Orleans, Louisiana**
February 21-25 2007

McCoy, K., Fremouw, W., Clegg, C. (February, 2007). Self-Injurious and Choking Game Behavior among College Students. Poster presented at the Southeaster Psychological Association in New Orleans, LA.

Tyner, E. A., Messer, J. M., **McCoy, K. L.**, Fremouw, W., & Baker, E. (February, 2007). *Suicide assessment with adolescent substance users: Risk and resilience factors*. Paper presented at the South Eastern Psychological Association in New Orleans, LA.

❖ **Regional McNair Scholars Research Conference** **Morgantown, WV**
April, 2006

McCoy, K., Tyner, E., Johansson-Love, J., Strunk, J., & Clegg, C. Self-Injurious Behavior and Criminal Thinking Style among College Students.

❖ **American Psychology-Law Society Annual Conference** **St. Petersburg, FL,**
March 2-5, 2006

K. McCoy, E. Tyner, J. Johansson-Love, J. Strunk, and C. Clegg. Criminal Thinking Styles and Illegal Behavior among College Students: Validation of the PICTS.

❖ **McNair National Scholars Research Conference** **University of Tennessee at Knoxville, July2005**

K. McCoy, W. Fremouw, E. Tyner & J. Johansson-Love. Relationship among Criminal Thinking Style, Illegal Behavior and Sensation Seeking among College Students

❖ **Tri State Psychology Conference** **West Virginia University,**
April 2005

K. McCoy, W. Fremouw, E. Tyner & J. Johansson-Love. Relationship among Criminal Thinking Style, Illegal Behavior and Sensation Seeking among College Students

Teaching Experience

Life Span Developmental Psychopathology – Guest Lecture, October 16, 2008.

Psychology of Violence – Guest Lecture, October 8, 2008.

Behavior Modification, Graduate Teaching Assistant, September 2008, Supervisor, Joseph Scotti, Ph.D.

McNair Scholar's Program – Graduate research mentor, May 2008 - June 2008, Supervisor: Betty Mei, Ph.D.

McNair Scholar's Orientation - Graduate research mentor, "Research", April 11, 2008, Supervisor: Betty Mei, Ed.D.

Psi Chi Meeting, Guest Speaker - "Getting into Graduate School", November 7, 2008.

McNair Scholars Program – Graduate research mentor, May, 2007 – June 2007, Supervisor: Betty Mei, Ed.D.

Multicultural Issues in Psychology - Graduate Teaching Assistant, Spring 2007, Supervisor: Dan McNeil, Ph.D.

Psychological Assessment - Guest Lecture on this history of psychological assessment, January 2007. Instructor: Barry Edelstein, Ph.D.

Introduction to Forensic Psychology - Graduate Teaching Assistant, Fall 2006, Supervisor: William Fremouw, Ph.D.

Clinical Practicum Experience

2008-Present: Hopemont Hospital, Supervisor: Barry Edelstein, Ph.D.

2008-Present: WVU Quin Curtis Center Clinical Team, Supervisor: Amy Fiske, Ph.D.

2006-2007: WVU Quin Curtis Center Clinical Team, Supervisor: Daniel McNeil, Ph.D.

Voluntary Clinical Experience

September 2008-Present: Kennedy Federal Corrections Institute Morgantown, Supervisors: Jennifer Myers, Ph.D. & Edward Baker, Ph.D.

May 2008- August 2008 -Chestnut Ridge Center, Residential Treatment Program for Adolescent Male Sexual Offenders, Supervisor: Christi Cooper-Lehki, MD

July 2007-June 2008 – West Virginia University Department of Family Medicine, Supervisor: Jeannie Sperry, Ph.D.

Fall 2006 – Morgantown High School, Adolescent Stress/Anger Management Group, Supervisor: William Fremouw, Ph.D.