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Pain tolerance feedback and deliberate self-harm in men and women

Matthew A. Timmins
timmins.matthew@hotmail.com

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By

Matthew A. Timmins

Approved by:

Mitchell E. Berman (Major Professor)
Kevin J. Armstrong
Michael S. McCloskey
Michael R. Nadorff
Kevin J. Armstrong (Graduate Coordinator)
Rick Travis (Dean, College of Arts & Sciences)

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Name: Matthew A. Timmins

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Institution: Mississippi State University

Major Field: Applied Psychology (Clinical Concentration)

Major Professor: Mitchell E. Berman

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There is a growing literature supporting the idea that those who engage in non-suicidal deliberate self-harm (DSH) have altered pain perception compared to individuals who do not. For example, individuals who report a history of non-suicidal DSH behavior have a decreased sensitivity to transient pain during laboratory-based pain induction (e.g., Glenn et al., 2014). Research suggests that brief manipulations targeting individual beliefs can affect performance on subsequent tasks, including measures of pain sensitivity. To date, however, no study has examined the effects of experimentally manipulated pain perception on DSH behavior. The Self-Aggression Paradigm (SAP: Berman & Walley, 2003; McCloskey & Berman, 2003) allows for the prospective observation of the effects of experimental manipulations on a laboratory analogue of DSH. Therefore, the aim of the current study was to determine if experimentally manipulated false feedback about pain tolerance affects DSH behavior during the SAP, thus potentially providing evidence for a causal linkage between pain perception and DSH. Eighty participants were randomly assigned to one of three feedback groups: High pain tolerance, low pain tolerance, and a control condition with neutral feedback provided after completing the SAP. Participants were provided false feedback regarding their pain tolerance after a pressure algometer task. It was predicted that participants in the high pain tolerance feedback group

would have the highest DSH on the SAP, with DSH defined as the level of shock self-administered during a series of reaction-time trials. No significant group differences, however, emerged based on group assignment. Men engaged in more DSH than women during the study independent of feedback group assignment. A secondary aim of the current study was to provide further validation for the SAP using multiple pain induction modalities. Implications of the current findings and future research directions are discussed.

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CHAPTER I

INTRODUCTION

General Introduction

According to the Centers for Disease Control and Prevention (CDC), *non-suicidal self-injury* (NSSI)—any behavior that intentionally results in physical harm to oneself without the intent to die (Crosby et al., 2011)—accounted for 492,037 cases of medical treatment in the United States in 2017 (CDC & National Center for Injury Prevention and Control, 2005). Further, 47,173 individuals died by *suicide*—death resulting from injury to oneself with intent to die (Crosby et al., 2011)—in the United States in the same year (CDC & National Center for Injury Prevention and Control, 2005). NSSI and suicide represent the spectrum of behaviors that make up *deliberate self-harm* (DSH), which is any behavior that intentionally results in physical harm to oneself, regardless of lethality or intent of lethality (Muehlenkamp et al., 2012). However, low lethality DSH behaviors, including NSSI, often do not come to the attention of medical professionals; thus, actual rates of non-lethal DSH are likely much higher.

DSH behaviors carry significant health, social, and financial consequences across one's lifetime (Corso, Mercy, Simon, Finkelstein, & Miller, 2007; Mars et al., 2014). In addition, suicide and NSSI appear to have similar risk factors (Joiner et al., 2012; Law et al., 2017; Nock et al., 2006; Victor & Klonsky, 2014), and NSSI appears to act as a gateway to suicidal behaviors (Whitlock et al., 2013). Thus, understanding the underlying mechanisms for NSSI may

provide important insight into more lethal DSH acts. One factor that is shared across DSH behaviors is the experience of pain.

The International Association for the Study of Pain (IASP) defines pain as "… an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage" (Merskey & Bogduk, 1994, p. 211). By definition, non-lethal DSH results in the experience of pain—absent neurological abnormalities or the consumption of an analgesic substance; thus, the experience of pain may play an important role in DSH. For instance, those who engage in non-lethal DSH appear to experience acute pain (i.e., pain with relatively rapid onset or offset, such as a skin laceration or bruising) differently than those who do not (e.g., Franklin, Aaron, Arthur, Shorkey, & Prinstein, 2012). In comparison, chronic pain is associated with higher rates of suicide attempts than in the general population (for a review, see Racine, 2018). Overall, whether the pain is acute (e.g., pain experienced during non-lethal DSH behavior) or chronic (e.g., pain experienced from arthritis or neuropathy), the experience of pain plays a key role in DHS.

As the IASP definition notes, the experience of pain is not limited to physical factors. In fact, several psychiatric diagnoses are associated with altered pain perception. In a systematic literature review by Vaughan and colleagues (2019), diagnoses of autism spectrum disorder (ASD) and attention deficit hyperactivity disorder (ADHD) were associated with hypersensitivity to painful stimuli. In comparison, diagnoses of schizophrenia, borderline personality disorder (BPD), and eating disorders demonstrated both hypersensitivity and hyposensitivity to painful stimuli; a phenomenon known as the *pain paradox* (Sansone & Sansone, 2007). One potential explanation for the pain paradox is the presence or absence of previous non-lethal DSH behavior. Recent data suggest that individuals with BPD demonstrate hyposensitivity to pain if they have

previously engaged in non-lethal DSH; otherwise, they demonstrate hypersensitivity to pain (Magerl et al., 2012).

This pattern of past DSH being associated with a decreased sensitivity to pain is consistent with longitudinal studies on DSH and current theories of suicide. Longitudinal data suggest that a repetitive history of NSSI is associated with an increased risk of suicidal behaviors, potentially by desensitizing individuals to the pain associated with DSH (e.g., Whitlock et al., 2013). This supports the concept of *acquired capability* for suicide described in the Interpersonal Theory of Suicide (IPTS: Van Orden et al., 2010) and the Three-Stage Theory of Suicide (3ST: Klonsky & May, 2015). Acquired capability refers to removal of barriers to suicidal behaviors by repeated exposure to emotionally and physically painful stimuli (e.g., Van Orden et al., 2010), such as NSSI.

Much of the existing literature on pain and DSH is based on self-report non-experimental methods, mainly due to ethical and practical issues. For one, lethal DSH behavior cannot be experimentally examined, nor can an individual report on the experience of pain postmortem. Another issue is the acquisition of decreased sensitivity to pain. A study design could conceivably include asking participants to repeatedly expose themselves to painful stimuli under laboratory conditions over the course of months to years; however, this sort of laboratory task is clearly impractical. Thus, most research on pain and non-lethal DSH has relied on characterizing groups based on self-reported histories of non-lethal DSH and then comparing pain induced under controlled conditions. Results of these studies do not allow for causal inferences regarding pain and DSH. However, these studies have provided important insights into differences in pain perception between those who do and do not have a history of non-lethal DSH. Two specific patterns of results have emerged: (1) Pain tolerance may differ between those who do and do not

engage in non-lethal DSH, and (2) cognitions regarding non-lethal DSH may affect the experience of painful stimuli (e.g., Franklin et al., 2012; Franklin, Puzia, et al., 2013; Glenn, Michel, Franklin, Hooley, & Nock, 2014; Hooley, Ho, Slater, & Lockshin, 2010; Hooley & St. Germain, 2013).

Although the above studies do not experimentally manipulate pain perception or prospectively examine non-lethal DSH, one laboratory analogue allows for the prospective observation of non-lethal DSH behavior under controlled conditions: The Self-Aggression Paradigm (SAP: Berman, Bradley, Fanning, & McCloskey, 2009; Berman et al., 2017; Berman & Walley, 2003; McCloskey & Berman, 2003). In the SAP, DSH is operationalized as the intensity of electrical shock a participant self-administers during a competitive reaction time game with either a computer (Sloan et al., 2006) or a fictitious opponent (e.g., Berman et al., 2017). The SAP allows researchers to introduce experimental manipulations prior to observing DSH behavior during a competitive reaction-time task, allowing researchers to draw causal inferences about the correlates of DSH. For example, the SAP has followed experimentally manipulated levels of alcohol consumption (Berman et al., 2009, 2017; McCloskey & Berman, 2003; Timmins, 2017). Findings from these studies support the notion that alcohol intoxication is associated with increased risk of DSH. More relevant to the present study, Timmins and colleagues in a secondary data analysis found that pain tolerance increased as a function of blood-alcohol concentration (BAC), which in turn mediated the relation between BAC and DSH behavior during the SAP; in other words, alcohol appeared to act as an analgesic and the resulting increased pain tolerance predicted more DSH behavior during the SAP (Timmins, 2017). No study to date, however, has attempted to directly manipulate perceived pain tolerance prior to the observation of DSH using the SAP.

Researchers have attempted to alter pain tolerance using cognitive (e.g., increasing positive self-worth; Hooley & St. Germain, 2013) or affective (e.g., inducing stress through public speaking; Franklin et al., 2012) manipulations. For example, participants who endorsed a history of DSH behavior demonstrated increased pain sensitivity (i.e., higher subjective pain) after a brief intervention to increase self-worth by identifying positive traits about themselves (Hooley & St. Germain, 2013). This is consistent with other findings regarding negative beliefs about the self and past DSH behaviors (e.g., Hamza, Willoughby, & Armiento, 2014). In another study, researchers provided pseudo-feedback about participants' pain tolerance and observed group differences in an inhibitory cognitive task (i.e., go/no-go task) unrelated to DSH (Rigoni et al., 2016). Participants who were told their pain tolerance was low failed to inhibit responses on more trials than those who were told their pain tolerance was high and those who did not receive feedback; however, a history of DSH behaviors was not examined (Rigoni et al., 2016). In the context of the SAP, pain tolerance has been altered as a function of psychoactive substances administered, such as alcohol, but pain perception was not the focus of these studies (Berman et al., 2005, 2009, 2017; McCloskey & Berman, 2003). To date, no SAP study has attempted to alter pain tolerance by manipulating participant's expectations of their pain tolerances. This leaves an important question left unanswered: Does one's expectation about their pain tolerance affect DSH behavior?

The purpose of the proposed study was to examine whether manipulating beliefs about one's pain tolerance with pseudo-feedback influences DSH behavior using the SAP. Findings from the proposed study could open a new avenue for basic and applied research in non-lethal DSH, as well as providing clinicians a potential marker for clients and patients who demonstrate other risk factors for DSH.

Note on Terminology

Pain have been studied within the DSH literature using several related pain constructs. These include: *Pain perception*, *pain intensity*, *pain threshold*, *pain tolerance*, and *pain endurance*. We define pain perception as any experience of a noxious stimulus that an individual deems "painful" and the associated aspects of pain. Pain intensity is the individual's subjective intensity rating of the experienced noxious stimulus. Pain threshold is the point at which an individual rates a noxious stimulus as painful, typically expressed as the strength or intensity of the stimulus (e.g., Franklin et al., 2012; Glenn et al., 2014; Hooley et al., 2010). Pain tolerance is the point at which an individual can no longer willingly sustain interaction with a painful stimulus, often determined by the intensity of the noxious stimulus or duration the individual was willing to endure a noxious stimulus at a constant intensity (e.g., Franklin et al., 2012; Hooley et al., 2010). Pain endurance is the difference between one's pain threshold and pain tolerance, typically measured by increase in either stimulus intensity or duration of a painful stimulus (e.g., Franklin et al., 2012; Glenn et al., 2014; Hooley et al., 2010).

Pain Perception and Non-Lethal DSH

Although chronic pain is associated with an increase in suicide, including non-fatal suicide attempts, there are fewer studies connecting chronic pain to less lethal DSH absent the intent to die (i.e., NSSI). As most non-lethal DSH behaviors result in acute pain—the notable exception being serious suicide attempts resulting in permanent damage—there is a growing interest in the experience of acute pain in those who engage in non-lethal DSH. Thus far, most researchers have done so by comparing pain perception under controlled conditions between participants who report a history of non-lethal DSH to those who deny such a history (e.g., Franklin, Puzia, et al., 2013; Glenn et al., 2014; Hooley et al., 2010; McCoy, Fremouw, &

McNeil, 2010). Other studies have made such comparisons while including experimental distress (e.g., Franklin et al., 2012; Gratz et al., 2011) or self-compassion (e.g., Gregory, Glazer, & Berenson, 2017; Hooley & St. Germain, 2013) manipulations or while examining motivations for DSH behavior (e.g., Hamza, Willoughby, & Armiento, 2014).

One study using adolescents in the United States found that participants who reported a history of non-lethal DSH, not limited to NSSI, had higher pain thresholds and endurances for pressure-induced (algometer) pain than those who denied a history, even after controlling for psychiatric diagnoses assessed using a structured clinical interview (Glenn et al., 2014). Additionally, a history of non-lethal DSH was associated with decreased self-reported pain intensity at the pain tolerance level. Similarly, past non-lethal DSH was associated with higher thresholds and endurances for pressure pain in a community sample of adults in the United States (Hooley et al., 2010). Similar group differences emerged in a sample of undergraduate students in the United States, such that pain threshold and pain tolerance were higher in those with a history of non-lethal DSH during a cold pressor task (CPT; Franklin et al., 2012). Results of these studies suggest that past non-lethal DSH is associated with higher pain threshold and tolerance, as well as reduced pain intensity; however, other studies revealed a more nuanced and complex relation between pain and past DSH behavior.

In a study by Hamza, Willoughby, and Armiento (2014), undergraduate participants in Canada who endorsed past non-lethal DSH were divided into groups based on the presence or absence of self-punishment as a motivation for non-lethal DSH. Those who endorsed a history of non-lethal DSH that was motivated by self-punishment demonstrated higher pain threshold and tolerance, as well as decreased pain intensity on the CPT compared to those without self-punishing motivation and controls (Hamza et al., 2014). Additionally, pain threshold, tolerance,

and intensity did not differ significantly between controls and those who engage in non-lethal DSH without self-punishing motivation. In a study using an adult community sample in the United States, participants who endorsed a history of NSSI—but not suicide attempts—demonstrated higher pain endurance compared to controls; however, after increasing feelings of self-worth, those with past NSSI had increased pain sensitivity compared to pre-manipulation measures and to those who denied a history of NSSI (Hooley & St. Germain, 2013). Further, Hooley and St. Germain (2013) found that pain endurance did not differ between those with and without past NSSI after the self-worth intervention, but these changes were not seen in a positive-mood induction condition. This decrease in pain endurance after increasing positive cognitions about the self, but not after increasing positive mood, is consistent with the finding that those who report past DSH behavior motivated by self-punishment have increased pain tolerances compared to those who are not motivated by self-punishment and those who deny past DSH (Hamza et al., 2014); in other words, increasing positive cognitions about the self may attenuate the effects of negative cognitions about the self on pain tolerance.

One other consideration is that the literature on non-lethal DSH and pain perception is relatively limited. For example, a systematic literature review by Kirtley, O'Carroll, and O'Connor (2016) identified 22 studies with independent samples that measured pain in the laboratory and self-reported non-lethal DSH (without including substance use as a form of NSSI). Moreover, 10 of the studies specifically recruited participants seeking inpatient or outpatient treatment of BPD (Kirtley et al., 2016). Although BPD is associated with increased risk of DSH, BPD is not the only psychiatric illness associated with increased risk of DSH, nor do all individuals who engage in DSH have a current psychiatric diagnosis. This means that not

only is more research needed with non-clinical samples, but also with clinical samples not limited to BPD.

As Kirtley, O'Carroll, and O'Connor (2016) point out in their systematic review, pain tolerance appears to be the most consistent component of pain perception that differs between those who do and those who do not have a history of non-lethal DSH, particularly when controlling for psychoactive medications. More recent studies echo this sentiment (e.g., Hamza & Willoughby, 2018). Based on the limited data, it may be that pain tolerance is a key component of pain perception within non-lethal DSH.

It should be noted that most studies on non-lethal DSH and pain perception have relied on non-experimental methods by comparing groups based on self-reported histories of DSH. Whereas some studies experimentally manipulated some distress (e.g., Franklin et al., 2012; Gratz et al., 2011; Hamza & Willoughby, 2018) or self-compassion (e.g., Hooley & St. Germain, 2013) to alter pain perception, all these studies relied on self-reported histories of non-lethal DSH. Although several other methods are available to study DSH under controlled laboratory conditions (for a review, see Ammerman, Berman, & McCloskey, 2018), the Self-Aggression Paradigm (the SAP: Berman & Walley, 2003; McCloskey & Berman, 2003) was used in the current study, given that the psychometric properties of the SAP are reasonably well-characterized.

The Self-Aggression Paradigm

The SAP consists of a pain tolerance procedure, followed by a competitive reaction-time task. During the pain tolerance procedure, participants indicate the intensities at which a stimulus is first detectable and then too painful to continue. During the competitive reaction-time task against a fictitious opponent or ostensibly against the average performance of others the same

age as the participants, participants are given the opportunity to self-administer the stimulus at a self-selected intensity on losing trials. These intensities are listed on a numeric scale from 1 to 10, as well as a 0 and a 20. The "10" option is set to be equivalent to the participant's pain tolerance and decreases by five percent for each subsequent level such that the "1" option is equivalent to 55% of the participant's pain tolerance. Participants are instructed that the "20" is equal to twice their pain tolerance and will cause tissue damage that will heal within a few hours; however, the "20" is actually set to the pain tolerance shock level and is equal to the "10." Selection of a "20" is considered a behavioral analog of non-lethal DSH as participants are led to believe that it will cause tissue damage when it does not. Participants are given the option to not experience the stimulus by selecting a "0" option. Although participants are told they are competing against another participant, or an average reaction-time of other participants, the SAP reaction-time task is predetermined so that half of the trials are winning trials and half the trials are losing trials. Generally, there are two indexes of shock selection that are used to determine levels of DSH behavior during the sap: (1) mean shock selected, and (2) the use of a "20" shock. However, the "20" shock appears to produce the clearest index of DHS, as it ostensibly exceeds pain tolerance and is associated with physical harm.

As the SAP is conducted under controlled laboratory conditions, experimental manipulations can be conducted prior to or during the SAP and allow for causal inferences to be made. For example, several SAP studies from our research group have manipulated acute alcohol intoxication prior to the SAP (e.g., Berman, Bradley, Fanning, & McCloskey, 2009; Berman et al., 2017; McCloskey & Berman, 2003) and demonstrated a consistent finding that acute alcohol intoxication increases the likelihood of engaging in non-lethal DSH behavior in the lab and appears to follow a dose-dependent relationship (Berman et al., 2017). Moreover, manipulations

during the reaction-time task found that the effects of alcohol intoxication can be attenuated by increasing self-focused attention (Berman et al., 2009). Important to the proposed study, the relation between alcohol intoxication and non-lethal DSH behavior was explained, in part, by differences in pain tolerance (Timmins, 2017); specifically, increased alcohol intoxication increased pain tolerance which in turn led to a greater amount of non-lethal DSH analog behavior, particularly for those who endorsed a history of NSSI (Timmins, 2017).

Whereas the current SAP literature lays the groundwork for future experimental manipulation studies, many studies using the SAP that have examined the effects of pain manipulations relied on psychoactive substances (Berman et al., 2005, 2009, 2017; McCloskey, Ben-Zeev, et al., 2009; McCloskey & Berman, 2003; Timmins et al., 2019). However, increasing self-awareness while intoxicated (Berman et al., 2009) attenuated DSH and while providing a self-harming model through a fictitious opponent's shock selection appeared to increase DSH (Berman & Walley, 2003).

As previous studies have demonstrated, it is possible to affect pain tolerance with brief cognitive interventions (e.g., Hooley & St. Germain, 2013). Outside of the DSH literature, direct pseudo-feedback about participants' pain perception has been associated with subsequent performance on an executive functioning task (Rigoni et al., 2016). To our knowledge, no study to date has attempted to manipulate pain perception and then observe DSH in the laboratory. Thus, the primary purpose of the proposed study is to determine if pseudo-feedback about pain perception influences behavior on a laboratory analogue of DSH (the Self-Aggression Paradigm).

Behavioral Measures of Pain

To address the limitations in the literature, one critique of SAP studies must be addressed: The exclusive use of electric shock to assess both pain and DSH. Researchers have several other safe and ethical techniques to induce pain within the laboratory. Determining which pain induction method to use requires a basic understanding of the physiological mechanisms involved and how each stimulus uniquely affects those mechanisms. Within the pertinent literature, most methods induce pain by activating *nociceptors* (or *cutaneous nociceptors*)—specialized *primary afferents* (neuronal axons that take sensory information to the spinal cord) located in cutaneous tissue that respond to intense, noxious stimuli (Ringkamp et al., 2013). Nociceptors respond to mechanical or ischemic (restriction of blood flow) pressure, as well as thermal, chemical, or electrical stimulation, depending on the nociceptor subtype. With some exceptions (e.g., Magerl et al., 2012), non-lethal DSH and pain studies have used mechanical pressure (pressure algometer), electrical stimulation, or heat/cold (e.g., the CPT) to induce pain in the laboratory. Researchers choose from these methods based on the components of pain perception that are being studied and any requirements of other tasks within the study. For the proposed study, the pressure algometer and electric shock will be used to measure and assess pain.

Pressure algometer (PA).

The PA is commonly used pain induction technique in the non-lethal DSH literature. The general PA procedure involves using a blunted object to place continuous pressure on a specific portion of the body, often a finger or knuckle, palm or back of a hand, or a forearm. The PA induces an aching pain by increasing pressure at a consistent rate until the participant indicates the pressure is painful. Pain tolerance is typically defined as the duration the participant can

withstand the sustained pressure equal to the pain threshold or as the greatest force that can be endured (e.g., St. Germain & Hooley, 2013). Tissue damage is avoided by setting a maximum duration and a maximum pressure force, as well as allowing participants to discontinue at any point. This mimics naturally occurring painful stimuli that humans will likely encounter; moreover, some variations of the blunted object are believed to create pain akin to pain experienced during cutting NSSI (e.g., Glenn et al., 2014).

Several comparisons can be made between the PA and CPT. One major advantage is that pain from the PA appears resistant to the several individual differences that can greatly affect CPT outcomes. For example, small variations (+/-2° Celsius), gender differences, time in menstrual cycle (e.g., Hellström & Lundberg, 2000), immune-mediated inflammation (e.g., Mitchell, MacDonald, & Brodie, 2004), and neuropathy (Devor, 2013), among others, have significant impacts on single-trial CPT outcomes. Second, although pain onset from the CPT is rapid, pain offset is relatively slow and varies based on the previously listed individual differences. Since PA pain onset and offset are faster than the CPT, the PA is better suited for multiple temporally spaced inductions during a single laboratory session. The PA has the added advantage of being flexible by altering the size and shape of the object used to create pressure, as well as being able to identify a specific, discrete body area for pain induction. On the other hand, although pain offset is more rapid than thermal methods, the pain onset and offset are not as immediate as other forms of pain induction (e.g., electrical stimulation) and the methods are more labor intensive; thus, the PA may not be the optimal method for methods requiring multiple inductions in relatively quick succession.

Electric shock.

While not used as often as CPT and PA techniques, researchers frequently use electric shock to induce pain in the laboratory. Unlike thermal and mechanical pressure pain, electric shock pain is not dependent on a specific nociceptor subtype. Instead, electric shock indiscriminately activates all nociceptors near the point of stimulation. Depending on the method of administration, electric shock can be used on a broad area of tissue or individual nociceptive neurons. Participants indicate the shock intensity at which the stimulus is painful and too painful to withstand further to respectively measure pain threshold and pain tolerance. To avoid tissue damage, shock durations are usually no more than a few seconds and maximum shock intensities are well within safe limits.

Several considerations should be made before using electrical stimulation to induce pain. As with PA pain, electric shock pain is not dependent on individual physiological differences and can be administered to specific, discrete areas on the body. Additionally, electric shock produces rapid pain onset and offset that is faster than pain induced via PA techniques with little work needed between administrations; thus, electric shock is well suited for frequent, repeated administrations during a single laboratory session but is inadequate for measuring pain offset. In contrast to CPT and PA methods, humans are less likely to experience electrical stimulation at intensities sufficient to produce pain compared to mechanical pressure and cold temperatures. Although this limits the ecological validity of electrical stimulation in non-lethal DSH pain, it allows for repeated experiences of pain under well-controlled conditions. Based on the relative rapid pain onset and offset, requirements of the paradigm to be used, and resistance to individual differences, electric shock and the PA will be used for the proposed study.

Current Study

To date, there are no studies that have experimentally targeted pain-related cognitions to affect pain perception in the context of non-lethal DSH. Additionally, as the SAP has relied heavily on the use of electric shock, there are little to no data to determine if pain perception from other commonly used pain induction methods would demonstrate a similar relationship with SAP behavior. The current study has one major aim: To explore whether predetermined feedback about one's pain tolerance alters DSH behavior during the SAP. In addition to the major aim, the study also observed whether pain perception from a stimulus other than electric shock (i.e., pressure algometer) predicts SAP outcomes; thus, gaining more information about the generalizability of the pain-SAP relationship. This was done by first collecting self-reported data about common forms of pain and then completing a pain threshold and pain tolerance procedure using PA. Following the PA procedure, participants were provided predetermined pseudo-feedback that they have relatively high or relatively low pain tolerances compared to the general population. Participants in the control group were told the amount of force they were able to tolerate without any indication of how their pain tolerance compares to others. Then participants underwent the SAP tolerance procedure and then the SAP task.

Prediction

It was predicted that DSH during the SAP would be altered in the direction of the pain tolerance pseudo-feedback. In other words, those told their pain tolerance is high would engage the higher levels of DSH, on average, as operationalized by the intensity of shock self-administered during the SAP.

CHAPTER II

METHOD

Participants

Ninety participants were recruited through the MSU Psychological Research Program (PRP) for undergraduate volunteers (n = 55) or using flyers for a paid study (see Appendix A) placed on campus and the surrounding community (n = 35). Volunteers were told the purpose of the study was: To examine the relationship between pain perception and performance on tasks. The PRP is an online service by SONA Systems that is maintained by the MSU Department of Psychology to recruit and compensate student participants for psychological research. Participants from the local community were compensated $15 dollars per hour of participation, rounded up to the nearest hour, for up to two hours—$30. To reduce the influence of age differences on pain perception, participants were required to be age 18 to 35. Further inclusion criteria were sufficient proficiency in written and oral English to follow the directions of the study and physically able to complete the required tasks. Ten volunteers were excluded from the final data set due to equipment failure (n = 2) or serving as pilot participants during which the task instructions were refined (n = 8). The final sample (N = 80) consisted of 28 men and 52 women between the ages of 18 and 32 (mean age = 19.58 years-old, SD = 2.91 years).

An a priori power analysis was initially conducted using the pwr package (Champely, 2018) for R 3.6.1 (R Core Team, 2019). Results revealed that with alpha = .05 and power = .8, a sample of 90 participants (30 per group) would have been sufficient to detect a medium to

large effect size of $\eta^2 = .333$. However, various research restrictions during the COVID-19 pandemic necessitated a somewhat smaller sample be used for this project. Please see Appendix B for a description of modifications made to the protocol in this regard.

All potential participants were pre-screened using a brief telephone interview for possible participation in the study (see Appendix C). Community volunteers contacted the laboratory and were either immediately screened or asked to leave a voicemail message with their name and availability to complete the phone screen, based on whether a researcher was present in the laboratory at the time of the call. PRP volunteers completed the telephone screen on the day of their scheduled appointment before arriving at the laboratory using the SONA system.

In total, 138 volunteers completed or started the phone screen, including the ten participants noted above that were removed from the final analysis. Out of these 140, 132 volunteers met the inclusion and exclusion criteria. Participants were excluded if they are under the age of 18; were unable to comprehend or follow the instructions for the given measures and tasks; were receiving medication with analgesic effects; did not abstain from alcohol or other recreational substances for 24 hours prior to the in-person laboratory session; had a history of cardiac disease or seizure disorder; recent significant injury to their non-dominant hand; and any other medical condition for which electrical stimulation is contraindicated. Participants were also excluded if they were currently enrolled in any class in which the instructor of record is one of the investigators to avoid any undue influence.

Of the 132 volunteers who were invited to complete the study after meeting inclusion and exclusion criteria, 38 did not arrive at the laboratory for their scheduled or rescheduled appointment or canceled their appointment (35 PRP volunteers; three community volunteers), and two participants were removed due to hardware or software failure preventing data

collection. Another two participants started the phone screen but withdrew before completing the phone screen (see Figure 1 for a consort diagram)

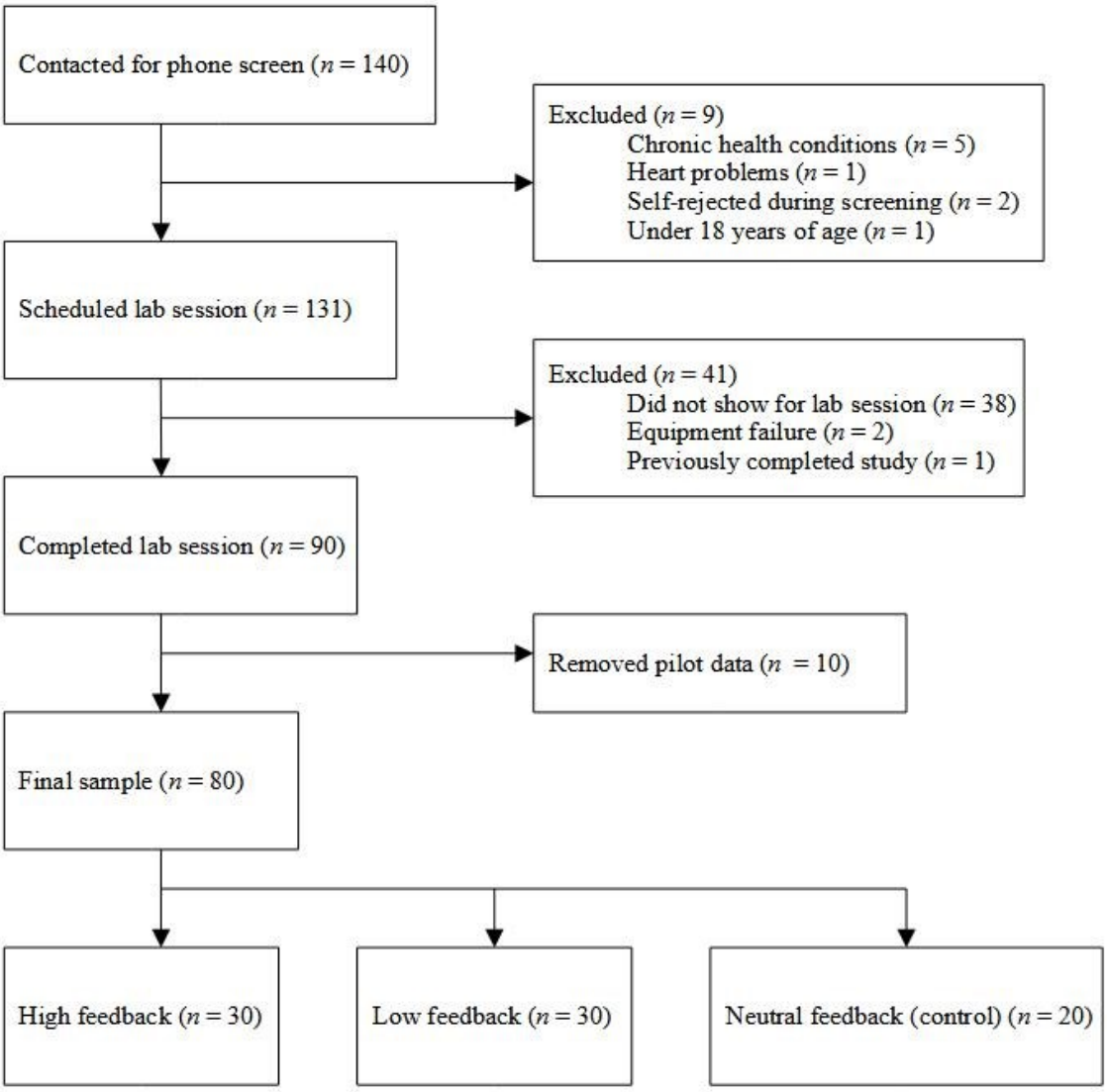

Figure 1. Consort diagram for participants included in this study

Ninety community (n = 35) and undergraduate student (n = 55) participants completed the study, including the ten participants who were removed from analyses as part of changes from the pilot or for hardware failures during the laboratory session. Of the 80 participants included in the analyses, regarding self-identified race and ethnicity, 48 (60.0%) identified as White, 25 (31.3%) identified as African American/Black, four (5.0%) identified as Biracial/Multiracial, one (1.3%) identified as Hispanic/Latin American, one (1.3%) identified as Native American/Inuit/Native Alaskan, and one (1.3%) identified as other. Regarding marital status, 78 (97.5%) identified as never married and two (2.5%) identified as married. All procedures and the consent process used in the current study were approved by the Institutional Review Board at Mississippi State University (see Appendix D for the original IRB Approval Letter – note that the IRB approved COVID-19 and other minor modifications at a later date, and see Appendix E for the document used to support informed consent).

Measures

Self-report Measures

Qualtrics (https://www.qualtrics.com) online survey software was used to create and administer all self-report measures used in this study. As this study is a part of a larger project, only the measures relevant to this study are described below. Measures not included in this study were collected for use in future analyses. See Appendix G for the complete list of the measures administered.

Demographics and health questionnaire.

To gather information about participants' demographics and health history, a brief questionnaire was administered during the laboratory session. Participants were asked to report

demographic information, such as age, sex, gender identity, ethnicity/race, and marital status. Participants were asked to report on health history information, such as hospitalizations, surgeries, current medications, current allergies, cardiovascular health, neurological health, mental health concerns, substance use, head injuries, concussions, loss of consciousness, and hand injuries. This information was collected after inclusion and exclusion criteria were assessed via the telephone screen.

Pain Sensitivity Questionnaire (PSQ: Ruscheweyh, Marziniak, Stumpenhorst, Reinholz, & Knecht, 2009).

The PSQ is a 17-item survey that measures pain intensity of common pain stimuli (e.g., bumping a shin into a hard object such as a coffee table corner, mild sunburn, walking on a cold floor). Participants rate the pain of the stimulus on a 0 ("not at all painful") to 10 ("most severe pain imaginable") scale. In the original validation study using a German sample, the PSQ demonstrated good internal consistency ($\alpha = .92$; Ruscheweyh et al., 2009). An English version also was provided in the original validation study. The PSQ was used to assess baseline expectations about participant's pain sensitivity.

Life History of Aggression Self-Aggression Subscale (LHA: Coccaro et al., 1997).

The LHA is a 11-item measure that asks participants to indicate if they have ever engaged in specific aggressive behaviors directed at others or themselves, as well as anti-social behaviors. Participants report the number of times they engaged in each behavior between the ages of 13-18 and as an adult. The LHA demonstrated good internal consistency in the validation study ($\alpha = .95$; Coccaro, Berman, & Kavoussi, 1997). The Self-Aggression subscale of the LHA consists of two items regarding DSH, one for NSSI and one for past suicide attempts.

Deliberate Self-Harm Inventory (DSHI: Gratz, 2001).

The DSHI is a 17-item self-report measure used to assess a history of NSSI behaviors. Each item asks participants to indicate if they have engaged in a specific form of NSSI behavior (e.g., cutting, burning, self-poisoning). For each behavior that the participant indicates they have engaged in, the participant will be asked to report the following: 1) age when the participant first engaged in the behavior; 2) number of times they have engaged in the behavior; 3) date of the most recent episode of the behavior; 4) number of years the participant has engaged in the behavior; and 5) whether or not the behavior resulted in hospitalization or required medical attention. The DSHI has demonstrated good to adequate internal consistency (α = .72-.90) in US undergraduate students (Gratz, 2001; Wester et al., 2016), US and Canadian community samples (Turner et al., 2015), and in a German psychiatric inpatient sample (Fliege et al., 2006). Overall, the DSHI provides multiple outcome variables, and the current study used the number of methods used and the total number of episodes across methods of DSH. It should be noted that the total number of episodes was recoded into integers prior to analyses as participants were provided a free text option to provide additional details. For example, if a participant responded that they could not remember the number of episodes but the youngest age of the behavior and the date of the last behavior were listed, the response was recoded to two because two episodes could be confirmed. Also, if a participant responded with "more than" a specific number of episodes, the response was recoded to the specific number plus one (e.g., a response of "more than 20" would be recoded to 21 episodes).

Post-task survey.

Participants were asked to describe what they believe the true aims of the study are. This will be used to ensure that the deception techniques are sufficient. Further, participants who discover the true purpose of the study will be excluded from the analyses.

Pain perception

Pressure algometer.

Pressure pain (PP) perception was assessed using the AlgoMed computerized PA from Medoc, Ltd. The AlgoMed is a handheld PA with accompanying response button and software suite (Medoc Main Station, version Arbel 6.4.0.26.12). Medoc Main Station is used to collect intensity, change in force over time, pain threshold, and pain tolerance, as well as provide the researcher a tone indicating to stop applying pressure. PP tolerance (PPT) was operationalized as the average force required to reach pain tolerance across three trials.

Pressure pain intensity (PPI) was measured using a single item: "On a scale of 1 to 7, how strong was the most pain you felt from the pressure, with 1 being no pain at all and 7 being very painful." This will be used in manipulation checks to ensure pain induction procedures were able to produce pain or discomfort.

Electrical shock.

As part of the SAP, pain threshold and tolerance procedures are conducted prior to the reaction-time task. Electrical shock was delivered using a configuration of the BIOPAC® Systems, Inc. STMISOC/STM100C stimulator and the Measurement Computing© USB-1208HS-4AO Analog Input and Digital I/O card. For safety purposes, the hardware for this configuration did not allow for the stimulus to exceed 200 volts, nor did the stimulation last

longer than 2 seconds. In addition, the current was set to relatively low amperages—which cannot exceed 20 mA based on hardware design—which ensures that the maximum shock of 100 volts is safe to be used with human participants. As part of a built-in safety check, this configuration ensures that the electrical stimulation does not exceed these parameters by performing an initial stimulation when the STMISOC/STM100C was switched on before the electrodes are attached to the participant. If the electrical stimulation exceeded these parameters during the safety check, a message box displaying an error with the hardware was displayed on the computer screen. For additional safety, the current study did not include a shock exceeding 100 volts. Further, E-Prime Studio 3.0 (Psychology Software Tools, 2018)—the software suite used to administer electric shocks and conduct the SAP—program for this study includes code that monitors the stimulation to ensure it does not exceed the 100 volts maximum set by the researchers. In the unlikely event that the hardware's built-in safety check fails to detect excessive stimulation, the E-Prime Studio program displayed a similar error and automatically terminated the experiment. If either of the error messages described above were displayed during the in-person session, the session was terminated, and the participant received compensation.

Electric shock is often used as a noxious stimulus in SAP studies due to the relatively rapid onset and offset of pain. This allows for multiple administrations in quick succession without causing hypergesia for subsequent administrations. Electric pain tolerance (EPT) was operationalized as the highest voltage administers before the participant indicated the shock is too painful to continue.

The Self-Aggression Paradigm

The Self-Aggression Paradigm (the SAP: Berman & Walley, 2003; McCloskey & Berman, 2003) is a behavioral measure of non-lethal DSH analogous behavior under laboratory

conditions. In addition to the EPT procedure described above, the SAP includes a reaction-time task consisting of 40 trials. For the current study, the participant was told that they are competing against a computer program using the average reaction time of individuals within the participant's age range and same gender. In reality, each series of trials was predetermined to have 20 winning trials and 20 losing trials. At the beginning of each trial, the participant was given the opportunity to self-select a shock intensity that they would receive if they lost the trial. Available shock values included 0 (no shock), 1 through 10 with 10 (equal to the participant's EPT), and a 20. The participant was told that the 20 option was an "extreme shock" that is "twice as the highest shock (the participant) experienced during the tolerance procedure" and "will cause minor tissue damage that will heal within a few hours;" however, the 20 was equivalent to the highest shock administer during the tolerance procedure and never exceeded 100 volts. Primary DSH behavior was defined as the number of 20 shocks selected. In addition to the total number of 20 shocks selected, mean shock selection is another measure of DSH during the SAP. Although it does not provide as clear of a measure as the total 20 shocks—which is explicitly described as causing minor tissue damage—mean shock accounts for the selection of 10 shocks that also result in pain. Thus, mean shock was used as a secondary DSH.

The SAP provided the opportunity to prospectively observe DSH behavior under controlled conditions after conducting experimental manipulations—manipulations to alter beliefs about one's pain perception in the case of the proposed study. SAP performance has been associated with self-reported history of suicidal ideation, as well as suicidal and non-suicidal DSH (Berman et al., 2005; Berman & Walley, 2003; McCloskey et al., 2012). Additionally, SAP performance has been positively associated with variables that are considered risk factors for DSH, such as alcohol intoxication (Berman et al., 2009, 2017; McCloskey, Berman, et al., 2009;

McCloskey & Berman, 2003), benzodiazepine use (Berman et al., 2005), and peer influences (Sloan et al., 2006, 2009). In contrast, SAP performance has not demonstrated a relation with the competitiveness on the reaction-time task, performance on the reaction-time task, social desirability, or anxiety (Berman & Walley, 2003).

Procedures

Group Assignment

Before the scheduled session, the participant was randomly assigned to one of three feedback conditions: High pain tolerance feedback (11 men, 19 women), low pain tolerance feedback (10 men, 20 women), and a no feedback control (7 men, 13 women). The latter group provided a baseline index of the relation between pain and DSH using the pressure algometer and were given neutral feedback at the end of the laboratory session. The high feedback and low feedback were slightly larger than the control group by design to potentially maximize the power to detect high and low group differences (which were deemed most important) due to COVID strictures.

Pre-Task Self-Report Measures

At the time of the scheduled session, the participant arrived at laboratory (Magruder 100) and was greeted by the researcher for the session. Before beginning any other procedures, participants completed a mandatory COVID-19 screen (see Appendix F) in the waiting area outside the laboratory. The researcher directed the participant to another room within the laboratory labeled “Room A.” The participant was seated in front of a computer monitor, keyboard, and mouse. The participant was instructed to complete a battery of self-report

measures on the provided computer and indicate to the researcher when they have completed the questionnaires.

Pressure Pain Induction

Prior to pain induction, the researcher gave the participant the response button to hold in their dominant hand. The participant was instructed to rest their non-dominant arm and hand on the provided table in the participant room (described below). The researcher placed the 1 cm^2 rubber tip of the AlgoMed on the dorsal side of the participant's non-dominant hand near the first metacarpal of the participant's ring finger. For health precautions, the tip of the AlgoMed was covered with a standard disposable biocompatible finger cot. The researcher then increased the pressure at a constant incremental rate of 10 kPa/s (±5 kPa/s) for each trial with a maximum force of 1000 kPa. On the first trial, the participant was instructed to press the feedback button once the pressure becomes painful. This process was done once and determined pain threshold. For the following 3 trials, the participant was instructed to press the feedback button when the pressure becomes too painful to continue, which was recorded as the participant's pressure pain tolerance for that trial. Each time that the participant pressed the feedback button, the software used to record each trial produced a tone for the researcher to stop the trial; thus, the participant determined when to terminate each trial. There was a 5-second break between each trial during which the AlgoMed was removed from the participant's hand. Repeated trials were used as some research has suggested that pain tolerance may not be reached within the safe force and duration parameters of the first or second trials (e.g., Lacourt, Houtveen, & van Doornen, 2012); however, hypergesic effects of repeated exposure to a noxious stimulus may result in reaching pain tolerance without exceeding safe parameters. For the current study, pressure pain tolerance (PPT) was operationalized as the average force used to produce pain tolerance across the three trials. If

the participant did not indicate the pressure is too painful to continue once the pressure has reached 1000 kPa, the participant's pain tolerance for that trial was recorded as 1100 kPa.

Experimental Manipulation of Pain Tolerance

The pseudo-feedback procedure was loosely based on procedures used by Rigoni and colleagues (2016). In their study, participants who were given false feedback that they had low pain tolerance demonstrated more difficulty inhibiting behaviors on a subsequent go/no-go task compared to those who were given no feedback or were told they had high pain tolerance (Rigoni et al., 2016). Combined with evidence that brief cognitive interventions may indirectly affect pain perception in those who self-injure (e.g., Hooley & St. Germain, 2013), the false feedback in the proposed study was expected to alter subsequent pain perception and task performance.

Pseudo-feedback.

For participants assigned to the high or low feedback groups, feedback ostensibly about the participant's PPT was presented by the researcher verbally and with the use of a graphic representation corresponding to the feedback group. Those in the high feedback group were told that their pain tolerance was higher than a percentage of participants who have completed similar studies with the percentage randomly generated between 79% and 93%. In contrast, participants in the low feedback group were told that their pain tolerance was higher than a percentage of participants who have completed similar studies with the percentage randomly generated between 7% and 21%. Feedback provided to the high and low feedback groups was not determined by the participant's actual PPT as group assignment is done prior to the scheduled session. Participants in the control group were not provided any information prior to other

laboratory tasks. Instead, they were provided feedback after completing the remaining laboratory tasks and told that their pain tolerance higher than a percentage of participants who have completed similar studies with the percentage randomly generated between 22% and 78%.

Electrical Pain Tolerance

Before attaching the fingertip electrodes to the participant, the researcher rubbed the participant's non-dominant index and middle fingertips with an alcohol wipe followed by emery paper to remove any excess oil or dead skin that may impede the electrical current. The researcher then placed fingertip electrodes on the same fingertips. After the electrodes were attached, the participant was given a headset and microphone to wear for the remainder of the shock procedure and SAP. The participant was told that the headset will be used to provide instructions to the participant while the researcher administered the shocks from the room labeled "Equipment Room" in the laboratory. Then the researcher left the room and began administering a series of electric shocks. The shocks lasted one second and each subsequent shock was increased by 10 volts, ranging from 10 volts to 100 volts. Although the hardware allows for a shock up to 200 volts to be administered, the limit was set to 100 volts as a precaution for participants. The participant was instructed to indicate when the shock became painful and when it became too painful to receive the next shock level. Electrical pain tolerance (EPT) was defined as the voltage at which the participant indicated it was too painful to continue. If the participant did not indicate that the shock became too painful to continue once reaching the maximum of 100 volts, the EPT was recorded as 110 volts and the voltage would not increase. Immediately following the electrical pain tolerance procedure, the participant completed the SAP.

Post-Task Measures

After completing the SAP, the researcher administered a post-task questionnaire followed by a brief individual debriefing. The post-task questionnaire included the single item to measure electrical pain intensity. At that time, the full purpose of the study was not provided in order to maintain the deception for future participants. Instead, the participant was told they can join one of multiple group debriefing sessions, during which the researcher will discuss the initial findings and further rational for the study. The researcher then thanked the participant for their time. Compensation for the study was granted through the PRP within one hour of completion of the study or directly paid in cash to community member participants.

CHAPTER III

RESULTS

All analyses were conducted using IBM SPSS version 26 (IBM Corporation, 2018), with the exception of the a priori power analysis. All analyses were two-tailed at alpha .05.

Descriptive Statistics

The mean, standard deviation, skewness, and kurtosis for DSH indexes (i.e., total 20 shocks selected [primary DSH], mean shock selected [secondary DSH], DSHI – methods, DSHI – frequency, and LHA-SAG), objective pain measures (i.e., pressure algometer pain tolerance and electric shock pain tolerance), and self-reported pain perception (i.e., PSQ) are reported in Table 1.

Table 1

Descriptive Statistics for Deliberate Self-Harm and Pain Variables

	Total 20s	Mean Shock	Algometer	Shock Pain	PSQ Average	LHA	DSHI - methods	DSHI - episodes
Mean	8.78	6.97	352.68	89.63	3.24	.86	.44	3.49
SD	14.67	3.39	210.58	16.95	1.15	2.17	1.10	12.68
Skewness	1.38	-.57	1.92	-1.59	.26	2.71	3.03	5.08
SE Skewness	.27	.27	.27	.27	.27	.27	.27	.27
Kurtosis	.16	-.80	3.83	1.34	-.68	6.61	8.78	29.45
SE Kurtosis	.53	.53	.53	.53	.53	.53	.53	.53

Note. Total 20s = number of 20 shocks across 40 trials; Mean Shock = mean shock across 40 trials; Algometer = average pressure pain tolerance across three trials; Shock Pain = electrical stimulation pain tolerance; PSQ = Pain Sensitivity Questionnaire; LHA = Life History of Aggression-Self-Aggression Subscale; DSHI – methods = Deliberate Self-Harm Inventory – methods of DSH behavior; DSHI – episodes = Deliberate Self-Harm Inventory – episodes of DSH behavior.

Bivariate Associations

Correlations among the variables listed in Table 1 are presented in Table 2. Spearman correlations for the total 20s, DSHI – methods, DSHI – episodes, and LHA-Self-Aggression Subscale are reported as these variables represent count data.

Table 2

Bivariate Correlations Among Deliberate Self-Harm and Pain Variable

	Total 20s	Mean Shock	Algometer	Shock Pain	PSQ	LHA	DSHI – methods	DSHI – episodes
Total 20s	--							
Mean Shock	.73**	--						
Algometer	.48**	.39**	--					
Shock Pain	.34**	.39**	.25*	--				
PSQ Average	-.21	-.33**	-.24*	-.22*	--			
LHA	.05	.06	.24*	.09	.16	--		
DSHI – methods	.16	.15	.19	.02	.17	.72**	--	
DSHI – episodes	.14	.17	.23*	.03	.13	.63**	.93**	--

Note. Total 20s = number of 20 shocks across 40 trials; Mean Shock = mean shock across 40 trials; Algometer = average pressure pain tolerance across three trials; Shock Pain = electrical stimulation pain tolerance; PSQ = Pain Sensitivity Questionnaire; LHA = Life History of Aggression-Self-Aggression Subscale; DSHI – methods = Deliberate Self-Harm Inventory – methods of DSH behavior; DSHI – episodes = Deliberate Self-Harm Inventory – episodes of DSH behavior.
*$p < .05$. **$p < .01$.

As anticipated, Total 20s and mean shock ($r_{sp} = .73$, $p < .01$) were associated and share about 53 percent of overlapping variance based on the coefficient of determination; although correlated, these are somewhat different measures of DSH behavior. Total 20s was also associated with pressure ($r_{sp} = .48$, $p < .01$) and shock ($r_{sp} = .34$, $p < .01$) pain tolerances. Similarly, mean shock was positively correlated with pressure ($r = .39$, $p < .01$) and shock ($r = .39$, $p < .01$) pain tolerances. Combined, these results suggest that higher pain tolerances were associated with increased DSH behavior during the SAP. Additionally, mean shock negatively correlated with the PSQ ($r = -.33$, $p < .01$). Thus, higher mean shock was associated with lower self-reported pain sensitivity. Although not statistically significant, there was a trending negative

correlation between PSQ and total 20s selected (r = -.21, p = .058). This trending correlation suggests it is possible that lower self-reported pain sensitivity was also related to more 20s selected; however, this must be interpreted with caution.

Pressure pain tolerance and shock pain tolerance were associated (r = .25, p < .05), suggesting that they are related but separate indexes of pain. Both pressure pain tolerance (r = -.24, p < .05) and shock pain tolerance (r = -.22, p < .05) were negatively associated with self-reported pain sensitivity; however, only pressure pain tolerance was associated with a self-reported history of DSH behavior (DSHI – episodes; r_{sp} = .23, p < .05). As expected, all self-report measures of DSH, the LHA Self-Aggression Scale, the DSHI methods, and the DSHI – episodes, were associated. The lack of significant correlations between self-reported history of DSH and shock pain tolerance, as well as the pressure pain tolerance being correlated with NSSI, as reflected by DSHI – episodes, suggests that participants' pain tolerances in the current study were related to past DSH behavior dependent on the methods used to assess pain.

Interestingly, neither the LHA Self-Aggression Scale or the DSHI – methods were associated with Total 20s or mean shock (all ps > .05). Although these measures were included for validation of the SAP, it is possible that the lack of correlation is a result of the low base-rate of DSH behavior in the general population and this sample, as well as the use of a non-clinical population sample. Within the current sample, only 16 (20%) of participants endorsed any DSH behavior on the LHA, and only 17 (21.3%) endorsed any form of DSH behavior on the DSHI. It should be noted that when DSHI – episodes was correlated using Spearman's rho, the pattern of significance remained mostly the same with the exception that DSHI – episodes was also correlated with pressure pain tolerance (r_s = .23, p < .05). As would be expected, DSHI – methods and DSHI – episodes demonstrated a strong correlation (r_s = .93, p < .01).

Demographic Variables and Feedback Group Assignment

Chi-square tests were conducted to determine participants in the three feedback groups differed as a function of recruitment group (i.e., community or undergraduate volunteers), biological sex, ethnicity, or age. All self-identification other than White or African American were collapsed into a single group as multiple cells would have a count of zero for a chi square analysis for ethnicity. There were no significant differences for recruitment group $X^2(2) = 1.03$, $p = .60$, biological sex, $X^2(2) = .07$, $p = .96$, or ethnicity, likelihood $X^2(4) = .94$, $p = .92$. A one-way ANOVA was conducted to determine if the groups differed as a function of age. No significant effects emerged, $F(2, 77) = .02$, $p = .98$. This suggests that the feedback conditions were largely similar on these potential confounds.

Pain Variables, Feedback Group Assignment, and Sex

To determine whether self-reported pain perception (PSQ), pressure pain tolerance, or electric pain tolerance differed as a function of feedback group and biological sex, three different 2 (Biological Sex) × 3 (Feedback Group) ANOVAs were conducted. No significant main or interaction effects for PSQ or electric shock pain tolerance were found. A significant main effect of biological sex for pressure pain tolerance was found $F(1, 79) = 4.61$ ($p < .01$). On average, men had higher pressure pain tolerances, $M = 477.20$ kPa ($SD = 257.31$ kPa) than women, $M = 285.64$ kPa ($SD = 143.34$ kPa). No other main or interaction effects for pressure pain tolerance were found.

Self-Report DSH Variables, Feedback Group Assignment, and Biological Sex

To determine whether self-reported history of DSH behavior (LHA Self-Aggression Subscale), number of methods of DSH behavior (DSHI – methods), or episodes of DSH behavior

(DSHI – episodes) differed as a function of feedback group or biological sex, two separate negative binomial generalized linear model analyses were conducted. An interaction effect between biological sex and low feedback versus the control group (Wald $X^2 = 4.22$, $p < .05$) for the LHA Self-Aggression Subscale; however, this result should be interpreted with caution and likely invalid as the Hessian matrix was singular. In the context of the current data, this is likely due to a lack of variation in DSHI scores between the feedback conditions. No other effects were found on the LHA Self-Aggression Subscale (all *p*s >.08). No main or interaction effects for feedback group assignment or biological sex on DSHI – methods were found (all *p*'s > .25). Main effects for high feedback (Wald $X^2 = 4.10$, $p < .05$) and biological sex (Wald $X^2 = 13.23$, $p < .01$), as well as an interaction between high feedback and biological sex (Wald $X^2 = 6.60$, $p < .05$) on DSHI – episodes were found. Combined, these results suggest that the feedback groups likely did not differ on self-reported histories of DSH behavior; thus, past DSH behavior likely did not influence group differences on SAP behavior.

Mean Shock as a Function of Feedback, Provocation, and Sex

To test the prediction that faux pain tolerance feedback would be associated with DSH, a 3 (Feedback) by 2(Sex) ANOVA was conducted. Prior to analyses, 20 shocks were converted to 11 in the dataset to limit the influence of outliers. No main or interaction effects were observed for feedback group assignment or biological sex (all *p*s > .6), suggesting the mean shock level selected during the SAP was not affected by group assignment or the participant biological sex.

Total 20s as a Function of Feedback Group Assignment and Biological Sex

A One-Way ANOVA using the log-transformed number of 20s was initially proposed to compare feedback groups. However, given the significant skew observed for overall 20s in Table

1 (1.38/0.27 = 5.12) and due to the count nature of the data, a generalized linear model using a negative binomial link function for count data was conducted using the total number of 20s used across all trials as the dependent variable. Overall, 35 of 80 participants used the 20 at least once (of the participants who used the 20 at least once, the usage ranged from one time through use of the 20 on all 40 trials). This analysis also accounts for the presence of excess 0s in the outcome variable set (see Heck et al. (2012)). Feedback condition was dummy coded to produce two independent variables (low versus control and high versus control). Biological sex was also included in the model, as well as the interaction between biological sex and the two dummy coded independent variables. As can be seen in Table 3, the only significant effect that emerged for biological sex. This is not surprising, as 50 percent of men used the 20 shock at least once during the 40 trials, whereas 40 percent of women used the 20 shock at least once during the trials.

Table 3

Generalized Linear Model – Tests of Model Effects of Feedback Group Assignment, Biological Sex, and Interactions on Total 20s Selected

	Type III		
Source	Wald X^2	*df*	*p*
Intercept	246.92	1	<.01
Low Feedback	.59	1	.44
High Feedback	.01	1	.93
Biological Sex	7.50	1	.01
High Feedback × Biological Sex	.21	1	.65
Low Feedback × Biological Sex	.04	1	.84

Note. Low Feedback = Low Feedback versus Control, High Feedback = High Feedback versus Control, *df* = degrees of freedom.

CHAPTER IV

DISCUSSION

The major aim of the current study was to determine whether pain tolerance feedback affects DSH behavior during the SAP. It was predicted that participants who were told that they had a higher pain tolerance would exhibit the highest DSH behavior during the SAP. The prediction that the experimental groups would differ on SAP outcomes was based on previous research that the current study procedures were loosely derived from (i.e., Hooley & St. Germain, 2013; Rigoni et al., 2016). However, pain feedback group differences on SAP behavior were not observed in the current study.

There are several potential explanations for why no group differences in SAP behavior emerged. One likely factor is the sample size and resulting power. Given that the previous research used to estimate sample sizes for the experimental manipulations incorporated relatively small sample sizes to detect group differences in altered pain sensitivity (Hooley & St. Germain, 2013) and subsequent performance on laboratory cognitive tasks (Rigoni et al., 2016), the effects observed in the prior studies were either large or the result of Type I error. The current study used a sample size which should have been sufficient to detect medium-large effects (but still had a non-trivial potential for a Type II error). More important, it is possible that group differences were present but in the small effect range. The present study might have been underpowered to detect such effects. Additionally, non-suicidal DSH is a relatively low base rate behavior in the general population but was intentionally over-sampled in the study by Hooley

and St. Germain (2013). The selective inclusion of participants with a self-reported history of DSH stands in contrast to the current study and might explain why no group effects emerged.

Another possible explanation for the lack of group differences is that the manipulation used was simply not robust enough to affect behavior during the SAP. The lack of significant group differences on shock pain tolerance, which was measured after the predetermined feedback for low feedback and high feedback groups and could serve as an indirect assessment of the pain tolerance manipulation, suggests that there was no effect of the manipulation on pain perception. Given that this is the first SAP study using similar but not identical manipulation procedures from previous research (i.e., Hooley & St. Germain, 2013; Rigoni et al., 2016), it could be that the procedures used in this study were inadequate to produce group differences or that similar manipulation procedures were not appropriate for the current SAP study.

Although the main aim of the current study did not find differences in SAP behavior based on feedback group assignment, the results of the current study provide support for the validity of the SAP. As past research using the SAP has typically used only one form of pain induction, namely electric shock, it has been difficult to state whether results of SAP studies were limited to DSH using electrical stimulation, which is much less commonly used than other methods (e.g., cutting or scratching; Gratz, 2001). The use of other pain modalities can be difficult for ethical reasons, such as allowing participants to cut themselves, or practical reasons, such as allowing time for pain offset using a cold pressor; however, pressure pain has been used in several DSH and pain perception studies (e.g, Hooley et al., 2010; Law et al., 2017; McCoy et al., 2010; Ruscheweyh et al., 2009; St. Germain & Hooley, 2013). Given the significant correlation between pressure pain tolerance and shock pain tolerance, as well as the finding that

both were correlated with the total 20s and mean shock selected during the SAP, there is evidence that results from SAP studies may be generalized to other forms of painful experiences.

Pressure and shock pain tolerances were not the only measure of pain perception that support the generalizability of the SAP in the study. The average PSQ score, which measures sensitivity to pain with higher average scores suggesting greater sensitivity to a variety of painful stimuli, had a significant negative correlation to the mean shocks selected and had a trending negative correlation with total 20s selected. Participants' pain sensitivity was also negatively correlated to both pressure pain tolerance and shock pain tolerance, which supports the assumption that pain sensitivity and pain tolerance measure separate but related components of pain perception. Drawing from these relationships, the current results support the notion that SAP outcomes are related to overall pain perception as well as its various components.

It is also notable that the LHA Self-Aggression Subscale, the DSHI – methods, and the DSHI – episodes were strongly correlated. The LHA groups counts of three types of aggressive behaviors. In the case of the LHA Self-Aggression Subscale, these behaviors are suicide attempts and episodes non-suicidal DSH. On the other hand, DSHI – methods and DSHI – episodes are, respectively, the sum of the number of methods used to engage in NSSI and the sum number of episodes of NSSI behavior. In other words, there was a correlation between the number of methods used to engage in and the number of non-suicidal DSH behaviors and the frequency of suicidal and non-suicidal DSH.

Clinical Implications

Although predetermined feedback about pain perception did not affect SAP behavior in the current study, these results provide support for a growing area of research in the conceptualization and treatment for NSSI. One recent conceptualization uses the benefits of

NSSI (e.g., rapid relief of negative emotions, effective in most individuals) and barriers of NSSI (e.g., knowledge of other affect regulation techniques, fear of or sensitivity to painful stimuli) to determine the risk of engaging in future NSSI (Hooley & Franklin, 2017). In the current study, biological sex was associated with differences in pain tolerance such that men had higher tolerance for pressure pain on average, which suggests that men had a weaker barrier to non-suicidal DSH compared to women, at least on the SAP. There is growing support that adherence to masculine norms is associated with chronic NSSI behaviors (e.g., Green et al., 2018). Though the potential differences between biological sex and gender identity were not examined in the current study, these findings support the notion that men may be at greater risk for non-suicidal DSH in certain contexts.

Strengths, Limitations, and Future Directions

There are several strengths and limitations to the current study. The inclusion of an additional pain induction modality and women participants help to support the generalizability of the SAP as a measure of pain related self-harm is a strength. The results of the current study also provide additional support for the SAP as a valid prospective behavioral measure of DSH.

The results of the current study are likely limited due to the small sample size as modest effects may have been present but were not detectable due to insufficient power. Considering that non-suicidal DSH is a low base rate behavior in the general population, which is mirrored in the current study, it is likely that even larger samples would be needed to detect modest effects in general population samples; however, samples from clinical populations may not require as many participants to detect such group differences.

REFERENCES

Ammerman, B. A., Berman, M. E., & McCloskey, M. S. (2018). Assessing non-suicidal self-injury in the laboratory. *Archives of Suicide Research*, *22*(2), 193–223. https://doi.org/10.1080/13811118.2017.1319312

Berman, M. E., Bradley, T. P., Fanning, J. R., & McCloskey, M. S. (2009). Self-focused attention reduces self-injurious behavior in alcohol-intoxicated men. *Substance Use & Misuse*, *44*(9–10), 1280–1297. https://doi.org/10.1080/10826080902961328

Berman, M. E., Fanning, J. R., Guillot, C. R., Marsic, A., Bullock, J., Nadorff, M. R., & McCloskey, M. S. (2017). Effect of alcohol dose on deliberate self-harm in men and women. *Journal of Consulting and Clinical Psychology*, *85*(9), 854–861. psyh. https://doi.org/10.1037/ccp0000222

Berman, M. E., Jones, G. D., & McCloskey, M. S. (2005). The effects of diazepam on human self-aggressive behavior. *Psychopharmacology*, *178*(1), 100–106. https://doi.org/10.1007/s00213-004-1966-8

Berman, M. E., & Walley, C. J. (2003). Imitation of self-aggressive behavior: An experimental test of the contagion hypothesis. *Journal of Applied Social Psychology*, *33*(5), 1036–1057.

Blevins, C. A., Weathers, F. W., Davis, M. T., Witte, T. K., & Domino, J. L. (2015). The Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5): Development and Initial Psychometric Evaluation. *Journal of Traumatic Stress*, *28*(6), 489–498. https://doi.org/10.1002/jts.22059.

Buss, A. H., & Perry, M. (1992). The Aggression Questionnaire. *Journal of Personality and Social Psychology*, *63*(3), 452–459. psyh. https://doi.org/10.1037/0022-3514.63.3.452.

Buysse, D. J., Reynolds III, C. F., Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research. *Psychiatry Research*, *28*(2), 193–213. https://doi.org/10.1016/0165-1781(89)90047-4.Centers for Disease Control and Prevention & National Center for Injury Prevention and Control. (2005). *Web-based Unjury Statistics Query and Reporting System (WISQARS)*. Web-Based Injury Statistics Query and Reporting System (WISQARS). https://webappa.cdc.gov/cgi-bin/broker.exe

Champely, S. (2018). *pwr: Basic Functions for Power Analysis* (1.2-2) [Computer software]. https://CRAN.R-project.org/package=pwr

Coccaro, E. F., Berman, M. E., & Kavoussi, R. J. (1997). Assessment of life-history of aggression: Development and psychometric characteristics. *Psychiatry Research*, *73*(3), 147–157. psyh. https://doi.org/10.1016/S0165-1781(97)00119-4

Coccaro, E. F., Kavoussi, R. J., Hauger, R. L., Cooper, T. B., & Ferris, C. F. (1998). Cerebrospinal fluid vasopressin levels: Correlates with aggression and serotonin function in personality-disordered subjects. *Archives of General Psychiatry*, *55*(8), 708–714. https://doi.org/10.1001/archpsyc.55.8.708

Crosby, A. E., Ortega, L., & Melanson, C. (2011). *Self-directed violence surveillance [electronic resource]: Uniform definitions and recommended data elements / Alex E. Crosby, LaVonne Ortega, Cindi Melanson.* Atlanta, Ga. : Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, Division of Violence Prevention, [2011]; edsgpr. https://login.proxy.library.msstate.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=edsgpr&AN=gprocn794443149&site=eds-live

Cyders, M. A., Littlefield, A. K., Coffey, S., & Karyadi, K. A. (2014). Examination of a short English version of the UPPS-P Impulsive Behavior Scale. *Addictive Behaviors*, *39*(9), 1372–1376. PubMed. https://doi.org/10.1016/j.addbeh.2014.02.013

Devor, M. (2013). Neuropathic Pain: Pathophysiological Response of Nerves to Injury. In *Wall and Melsack's Textbook of Pain* (Sixth, pp. 861–888). Elsevier.

Fanning, J. R., Berman, M. E., & Long, J. M. (2014). P3 and provoked aggressive behavior. *Social Neuroscience*, *9*(2), 118–129. https://doi.org/10.1080/17470919.2013.866596

Fanning, J. R., Berman, M. E., Mohn, R. S., & McCloskey, M. S. (2011). Perceived threat mediates the relationship between psychosis proneness and aggressive behavior. *Psychiatry Research*, *186*(2–3), 210–218. https://doi.org/10.1016/j.psychres.2010.09.010

Fliege, H., Kocalevent, R. D., Walter, O. B., Beck, S., Gratz, K. L., Gutierrez, P. M., & Klapp, B. F. (2006). Three assessment tools for deliberate self-harm and suicide behavior: Evaluation and psychopathological correlates. *Journal of Psychosomatic Research*, *61*(1), 113–121. https://doi.org/10.1016/j.jpsychores.2005.10.006

Franklin, J. C., Aaron, R. V., Arthur, M. S., Shorkey, S. P., & Prinstein, M. J. (2012). Nonsuicidal self-injury and diminished pain perception: The role of emotion dysregulation. *Comprehensive Psychiatry*, *53*(6), 691–700. https://doi.org/10.1016/j.comppsych.2011.11.008

Franklin, J. C., Puzia, M. E., Lee, K. M., Lee, G. E., Hanna, E. K., Spring, V. L., & Prinstein, M. J. (2013). The nature of pain offset relief in nonsuicidal self-injury: A laboratory study. *Clinical Psychological Science*, *1*(2), 110–119. psyh. https://doi.org/10.1177/2167702612474440

Glenn, J. J., Michel, B. D., Franklin, J. C., Hooley, J. M., & Nock, M. K. (2014). Pain analgesia among adolescent self-injurers. *Psychiatry Research*, *220*(3), 921–926. https://doi.org/10.1016/j.psychres.2014.08.016

Gratz, K. L. (2001). Measurement of deliberate self-harm: Preliminary data on the Deliberate Self-Harm Inventory. *Journal of Psychopathology and Behavioral Assessment*, *23*(4), 253–263.

Gratz, K. L., Hepworth, C., Tull, M. T., Paulson, A., Clarke, S., Remington, B., & Lejuez, C. W. (2011). An experimental investigation of emotional willingness and physical pain tolerance in deliberate self-harm: The moderating role of interpersonal distress. *Comprehensive Psychiatry*, *52*(1), 63–74. https://doi.org/10.1016/j.comppsych.2010.04.009

Gregory, W. E., Glazer, J. V., & Berenson, K. R. (2017). Self-compassion, self-injury, and pain. *Cognitive Therapy and Research*, *41*(5), 777–786. psyh. https://doi.org/10.1007/s10608-017-9846-9

Hamza, C. A., & Willoughby, T. (2018). A lab-based study exploring the associations among nonsuicidal self-injury, pain, and emotion among university students. *Psychiatry Research*, *269*, 462–468. https://doi.org/10.1016/j.psychres.2018.08.096

Hamza, C. A., Willoughby, T., & Armiento, J. (2014). A laboratory examination of pain threshold and tolerance among nonsuicidal self-injurers with and without self-punishing motivations. *Archives of Scientific Psychology*, *2*(1), 33–42. psyh. https://doi.org/10.1037/arc0000008

Heck, R. H., Thomas, S. L., & Tabata, L. N. (2012). *Multilevel modeling of categorical outcomes using IBM SPSS* (2012-12992-000). Routledge/Taylor & Francis Group; APA PsycInfo. https://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=2012-12992-000&authtype=sso&custid=magn1307&site=eds-live&scope=site&custid=magn1307

Hellström, B., & Lundberg, U. (2000). Pain perception to the cold pressor test during the menstrual cycle in relation to estrogen levels and a comparison with men. *Integrative Physiological and Behavioral Science*, *35*(2), 132–141. https://doi.org/10.1007/BF02688772

Hooley, J. M., Ho, D. T., Slater, J., & Lockshin, A. (2010). Pain perception and nonsuicidal self-injury: A laboratory investigation. *Personality Disorders: Theory, Research, and Treatment*, *1*(3), 170–179. psyh. https://doi.org/10.1037/a0020106

Hooley, J. M., & St. Germain, S. A. (2013). Nonsuicidal Self-Injury, Pain, and Self-Criticism: Does Changing Self-Worth Change Pain Endurance in People Who Engage in Self-Injury? *Clinical Psychological Science*, *2*(3), 297–305. https://doi.org/10.1177/2167702613509372

IBM Corporation. (2018). *IBM SPSS Statistics for Windows* (Version 25) [Windows]. IBM Corporation.

Joiner, T. E., Ribeiro, J. D., & Silva, C. (2012). Nonsuicidal self-injury, suicidal behavior, and their co-occurrence as viewed through the lens of the interpersonal theory of suicide. *Current Directions in Psychological Science*, *21*(5), 342–347. psyh. https://doi.org/10.1177/0963721412454873

Kirtley, O. J., O'Carroll, R. E., & O'Connor, R. C. (2016). Pain and self-harm: A systematic review. *Journal of Affective Disorders*, *203*, 347–363. https://doi.org/10.1016/j.jad.2016.05.068

Klonsky, E. D., & May, A. M. (2015). The Three-Step Theory (3ST): A new theory of suicide rooted in the "ideation-to-action" framework. *International Journal of Cognitive Therapy*, *8*(2), 114–129. psyh. https://doi.org/10.1521/ijct.2015.8.2.114

Lacourt, T. E., Houtveen, J. H., & van Doornen, L. J. P. (2012). Experimental pressure-pain assessments: Test–retest reliability, convergence and dimensionality. *Scandinavian Journal of Pain*, *3*(1), 31–37. https://doi.org/10.1016/j.sjpain.2011.10.003

Law, K. C., Khazem, L. R., Jin, H. M., & Anestis, M. D. (2017). Non-suicidal self-injury and frequency of suicide attempts: The role of pain persistence. *Journal of Affective Disorders*, *209*, 254–261. https://doi.org/10.1016/j.jad.2016.11.028

Magerl, W., Burkart, D., Fernandez, A., Schmidt, L. G., & Treede, R.-D. (2012). Persistent antinociception through repeated self-injury in patients with borderline personality disorder. *Pain*, *153*(3), 575–584. psyh. https://doi.org/10.1016/j.pain.2011.11.021

McCloskey, M. S., Ben-Zeev, D., Lee, R., Berman, M. E., & Coccaro, E. F. (2009). Acute tryptophan depletion and self-injurious behavior in aggressive patients and healthy volunteers. *Psychopharmacology*, *203*(1), 53–61. https://doi.org/10.1007/s00213-008-1374-6

McCloskey, M. S., & Berman, M. E. (2003). Alcohol intoxication and self-aggressive behavior. *Journal of Abnormal Psychology*, *112*(2), 306–311. https://doi.org/10.1037/0021-843X.112.2.306

McCloskey, M. S., Berman, M. E., Echevarria, D. J., & Coccaro, E. F. (2009). Effects of Acute Alcohol Intoxication and Paroxetine on Aggression in Men. *Alcoholism: Clinical and Experimental Research*, *33*(4), 581–590. https://doi.org/10.1111/j.1530-0277.2008.00872.x

McCloskey, M. S., Look, A. E., Chen, E. Y., Pajoumand, G., & Berman, M. E. (2012). Nonsuicidal self-injury: Relationship to behavioral and self-rating measures of impulsivity and self-aggression. *Suicide and Life-Threatening Behavior*, *42*(2), 197–209. https://doi.org/10.1111/j.1943-278X.2012.00082.x

McCoy, K., Fremouw, W., & McNeil, D. W. (2010). Thresholds and tolerance of physical pain among young adults who self-injure. *Pain Research & Management*, *15*(6), 371–377. psyh. https://doi.org/10.1155/2010/326507

Merskey, H., & Bogduk, N. (Eds.). (1994). Part III: Pain terms: A current list with definitions and notes on usage: In *Classification of Chronic Pain* (Second, pp. S215–S221). http://content.wkhealth.com/linkback/openurl?sid=WKPTLP:landingpage&an=00006396-198601001-00008

Mitchell, L. A., MacDonald, R. A. R., & Brodie, E. E. (2004). Temperature and the cold pressor test. *The Journal of Pain*, *5*(4), 233–237. https://doi.org/10.1016/j.jpain.2004.03.004

Muehlenkamp, J. J., Claes, L., Havertape, L., & Plener, P. L. (2012). International prevalence of adolescent non-suicidal self-injury and deliberate self-harm. *Child and Adolescent Psychiatry and Mental Health*, *6*, 10–10. PMC. https://doi.org/10.1186/1753-2000-6-10

Nock, M. K., Joiner, T. E., Gordon, K. H., Lloyd-Richardson, E., & Prinstein, M. J. (2006). Non-suicidal self-injury among adolescents: Diagnostic correlates and relation to suicide attempts. *Psychiatry Research*, *144*(1), 65–72. https://doi.org/10.1016/j.psychres.2006.05.010

Osman, A., Barrios, F. X., Kopper, B. A., Hauptmann, W., Jones, J., & O'Neill, E. (1997). Factor structure, reliability, and validity of the Pain Catastrophizing Scale. *Journal of Behavioral Medicine*, *20*(6), 589–605. https://doi.org/10.1023/A:1025570508954

Psychology Software Tools. (2018). *E-Prime Studio* (Version 3) [Windows 10]. Psychology Software Tools.

R Core Team. (2019). *R: A Language and Environment for Statistical Computing* (3.6.1) [Windows]. R Foundation for Statistical Computing. https://www.R-project.org

Racine, M. (2018). Chronic pain and suicide risk: A comprehensive review. *Chronic Pain and Psychiatric Disorders*, *87*, 269–280. https://doi.org/10.1016/j.pnpbp.2017.08.020

Rigoni, D., Braem, S., Pourtois, G., & Brass, M. (2016). Fake feedback on pain tolerance impacts proactive versus reactive control strategies. *Consciousness and Cognition*, *42*, 366–373. https://doi.org/10.1016/j.concog.2016.04.015

Ringkamp, M., Raja, S. N., Campbell, J. N., & Meyer, R. A. (2013). Peripheral Mechanisms of Cutaneous Nociception. In *Wall and Melsack's Textbook of Pain* (Sixth, pp. 1–30). Elsevier.

Rush, A. J., Trivedi, M. H., Ibrahim, H. M., Carmody, T. J., Arnow, B., Klein, D. N., Markowitz, J. C., Ninan, P. T., Kornstein, S., Manber, R., Thase, M. E., Kocsis, J. H., & Keller, M. B. (2003). The 16-Item quick inventory of depressive symptomatology (QIDS), clinician rating (QIDS-C), and self-report (QIDS-SR): a psychometric evaluation in patients with chronic major depression. *Biological Psychiatry*, *54*(5), 573–583. https://doi.org/10.1016/S0006-3223(02)01866-8

Ruscheweyh, R., Marziniak, M., Stumpenhorst, F., Reinholz, J., & Knecht, S. (2009). Pain sensitivity can be assessed by self-rating: Development and validation of the Pain Sensitivity Questionnaire. *Pain*, *146*(1–2), 65–74. https://doi.org/10.1016/j.pain.2009.06.020

Sansone, R. A., & Sansone, L. A. (2007). Borderline personality and the pain paradox. *Psychiatry (Edgmont (Pa. : Township))*, *4*(4), 40–46. PubMed.

Saunders, J. B., Aasland, O. G., Babor, T. F., De La Fuente, J. R., & Grant, M. (1993). Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption-II. *Addiction*, *88*(6), 791–804. https://doi.org/10.1111/j.1360-0443.1993.tb02093.x

Sloan, P. A., Berman, M. E., Zeigler-Hill, V., & Bullock, J. S. (2009). Group influence on self-aggression: Conformity and dissenter effects. *Journal of Social and Clinical Psychology*, *28*(5), 535–553. psyh. https://doi.org/10.1521/jscp.2009.28.5.535

Sloan, P. A., Berman, M. E., Zeigler-Hill, V., Greer, T. F., & Mae, L. (2006). Group norms and self-aggressive behavior. *Journal of Social and Clinical Psychology*, *25*(10), 1107.

St. Germain, S. A., & Hooley, J. M. (2013). Aberrant pain perception in direct and indirect non-suicidal self-injury: An empirical test of Joiner's interpersonal theory. *Comprehensive Psychiatry*, *54*(6), 694–701. https://doi.org/10.1016/j.comppsych.2012.12.029

Timmins, M. A. (2017). *Does prior NSSI moderate the relationship between alcohol intoxication, pain, and deliberate self-harm?* [M.S., Mississippi State University]. https://search.proquest.com/pqdtglobal/docview/1994556280/abstract/7292076A45DB4D1DPQ/1

Timmins, M. A., Berman, M. E., Nadorff, M. R., Amadi, S. C., Fanning, J. R., & McCloskey, M. S. (2019). Does state dissociation mediate the relation between alcohol intoxication and deliberate self-harm? *Archives of Suicide Research*, 1–24. https://doi.org/10.1080/13811118.2018.1563577

Van Orden, K. A., Witte, T. K., Cukrowicz, K. C., Braithwaite, S. R., Selby, E. A., & Joiner, T. E. (2010). The interpersonal theory of suicide. *Psychological Review*, *117*(2), 575–600. https://doi.org/10.1037/a0018697

van Spijker, B. A. J., Batterham, P. J., Calear, A. L., Farrer, L., Christensen, H., Reynolds, J., & Kerkhof, A. J. F. M. (2014). The Suicidal Ideation Attributes Scale (SIDAS): Community-Based Validation Study of a New Scale for the Measurement of Suicidal Ideation. *Suicide and Life-Threatening Behavior*, *44*(4), 408–419. https://doi.org/10.1111/sltb.12084

Victor, S. E., & Klonsky, E. D. (2014). Correlates of suicide attempts among self-injurers: A meta-analysis. *Clinical Psychology Review*, *34*(4), 282–297. psyh. https://doi.org/10.1016/j.cpr.2014.03.005

Victor, S. E., & Klonsky, E. D. (2016). Validation of a Brief Version of the Difficulties in Emotion Regulation Scale (DERS-18) in Five Samples. *Journal of Psychopathology and Behavioral Assessment*, *38*(4), 582–589. https://doi.org/10.1007/s10862-016-9547-9

Wester, K. L., Ivers, N., Villalba, J. A., Trepal, H. C., & Henson, R. (2016). The relationship between nonsuicidal self-injury and suicidal ideation. *Journal of Counseling & Development*, *94*(1), 3–12. psyh. https://doi.org/10.1002/jcad.12057

Whitlock, J., Muehlenkamp, J., Eckenrode, J., Purington, A., Baral Abrams, G., Barreira, P., & Kress, V. (2013). Nonsuicidal self-injury as a gateway to suicide in young adults. *Journal of Adolescent Health*, *52*(4), 486–492. psyh. https://doi.org/10.1016/j.jadohealth.2012.09.010

Zanarini, M. C., Vujanovic, A. A., Parachini, E. A., Boulanger, J. L., Frankenburg, F. R., & Hennen, J. (2003). A Screening Measure for BPD: The McLean Screening Instrument for Borderline Personality Disorder (MSI-BPD). *Journal of Personality Disorders*, *17*(6), 568–573. https://doi.org/10.1521/pedi.17.6.568.25355

APPENDIX A

RECRUITMENT FLYER

Volunteers Wanted!

Clinical Studies Lab

Earn up to $30 by getting involved in research.

Pain Perception and Performance

The MSU Department of Psychology Clinical Studies Lab (CSL) is looking for healthy volunteers age 18 to 35 to complete a study on pain perception, personality, and behavior. The study will take about 2 hours to complete.

If interested, call the CSL to see if you are eligible (662-325-7597) and leave a message for Matthew

CSL-leave a message for Matthew Call: (662) 325-7597
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APPENDIX B

CHANGES FROM THE PROPOSED STUDY

After the current study was proposed, several changes in the method were implemented based on feedback from committee members, feedback from the MSU IRB, information gathered from pilot data, and the COVID-19 pandemic. All appropriate changes were approved by the MSU IRB either through formal addendum requests or through guidelines provided campus-wide by the University for in-person research. Changes pertinent to the current study are briefly discussed in the following sections.

Changes from Feedback

Several suggestions were provided regarding the experimental manipulations and participant inclusion during the study proposal and IRB application process. To increase the cover story for the feedback, each feedback condition was given a range of percentages to be randomly selected compared to the original single percentage per group. Further, participants in the neutral control group originally were never given feedback percentages, which was then changed to mirror the feedback protocols for the high feedback and low feedback groups but given at the end of the laboratory session. Further, the original proposal included the inclusion of a normal curve graph for visual feedback; however, that was changed to a graphic that roughly mirrored those used by Rigoni and colleagues (2016).

In the original proposal, the exclusion criteria included a wider range of prescription medications and any recreational substance use; however, this was changed based on feedback from the IRB. The exclusion criteria was narrowed to prescriptions that directly impact pain perception, and the current use of recreational substance use was altered to be included in the abstinence protocol before the laboratory session with alcohol.

Changes after Pilot Data

In the original instructions given throughout the laboratory session, pressure and electric shock were described in terms of "pain or discomfort." However, behavioral observations from the researchers and verbal comments made by participants suggested that those terms did not create a sufficient cover story for the 20-shock; thus, the experiences were described in terms of "pain" alone.

Changes in Response to the COVID-19 Pandemic

Several major changes to the originally proposed study were made in reaction to the pandemic. Consistent with University guidelines, potential participants were verbally screened for COVID-19 symptoms, testing, or potential exposures within the past two weeks. This screening was completed again for participants at the beginning of the laboratory session prior to being asked about following the 24-hour protocol. Any participants who endorsed any items on the screening were asked to reschedule after 14 days without symptoms or potential exposures.

A significant change to the current study after the proposal was changing from two researchers—Researcher A and Researcher B in the proposed study—to having a single researcher per session. The inclusion of two researchers would have allowed for researcher blinding for the electric shock protocol and SAP; however, the additional researcher would also create an additional risk of exposure in a limited space for all present during the laboratory session. We determined that with the protocol used for the current study, researcher blinding was not necessary to maintain the study's integrity and would require an increased risk for all involved during the pandemic.

Another notable change in current study was the inclusion of community members in the sample. In the proposed study, the sample was limited to undergraduate students enrolled in the

University; however, it was discussed and agreed during the proposal meeting that the sample may be expanded to include volunteers from the local community. As data collection was conducted during the COVID-19 pandemic and potential student volunteers may not have been in the area, we decided the expansion would help with data collection. As a result, compensation was also expanded to include monetary compensation, which was also not included in the original proposal. Although the pool of potential participants was expanded, we believe the additional COVID-19 precautions mitigated any additional risks for researchers and participants.

APPENDIX C

TELEPHONE SCREEN

Timmins Study

IMPORTANT-STORE THE COMPLETED FORM IN THE LOCKED CONSENT

DOCUMENT FILE

INTERVIEWER-after the interview, please circle either accept or reject

ACCEPT REJECT

(Please print clearly)

Subject Number (assign next number from tracking database):

Participant Name: _____

Phone: _____

Interviewer Name (first try): _____

Date:_____ Time: _____

Comments:

_____

Interviewer Name (second try if necessary): _____

Date: _____ Time: _____ Comments:

_____

"Hello, my name is and I am calling from Mississippi State University. Is this ? I am calling because you contacted us about our paid study on pain perception and performance. Are you still interested?" **(If yes, continue)**

"Good! I need to ask a few questions that we ask all volunteers to see if it is safe and appropriate for them to participate. This will only take about 10 minutes. Is now a good time to do this?"

(If no, ask is there is a mutually agreeable time to do the phone screen. Note in "comments" at the top of the form.)

"Okay, here we go…"

M / F

Age: _____

"Have you ever been in any research involving pain perception at Mississippi State? If so, please describe it to me." **(exclude if participated in a parallel pain study in our laboratory)**

_____

"Have you ever participated or heard about an experiment in the Psychology Department? If so, please describe it to me." **(exclude if participated in a parallel study in our laboratory)**

_____

"How did you hear about our study?"

(If a poster/advertisement, ask them where they saw it, what it said, and so forth. If a friend, ask what the friend told them. If potential problems with the deception, speak with Dr. Berman before scheduling them)

"Have you ever had any of the following medical problems? Please answer yes or no for each item."

For any YES answer, check with Dr. Berman before admitting into the study. Make detailed notes in each box (diagnosis if known, course of issue)

Chronic pain: Yes No	Heart problems: Yes No
Seizures or convulsive disorder: Yes No	Neurologic (nerve) disorders: Yes No
Hand injuries: Yes No	Other hand problems: Yes No

"Okay, now I am going to ask a few questions about your health habits. These won't exclude you

from participation. We will ask you about this in a bit more detail later if you participate in the study."

1. "Do you currently take any form of medication, either prescription or over the counter? For example: muscle relaxants, tranquilizers, antidepressants or other medication?"

a. Yes No

- **(If no) go to 2.**
- **(If yes)** "Please describe what medications you used, how often used, last use:"

---

2. "Have you used any 'recreational' drugs in the past month?"
a. Yes No

- **(If no)** go to 3.
- **(If yes)** "Please describe what drugs you used, how often used, last use:"

---

3. Have you used any alcohol in the past month?
a. Yes No

- **(If no) go to Telephone Script for Scheduling.**
- **(If yes)** "Pleased describe how much you typically consumed in a day, how often used, last use:"

Telephone Script for Scheduling

If eligible after the telephone screen (or after checking with Dr. Berman and re-contacted):

"Okay, let me tell you a little about our study. We are interested in the relationship between pain perception and various human behaviors, including reaction-time performance. The entire study will take about two hours and is being conducted in Magruder Hall at Mississippi State. Because the study also involves personality and behavior, we will ask a lot of questions, some of which are sensitive in nature, like the ones I asked you today over the phone. These include questions about your moods, thoughts, pain experiences, behaviors, and health.

We will also ask you to do a couple of performance tasks. These will include two measures of pain perception using pressure and electrical stimulation. These are commonly used methods to measure pain perception in the laboratory, and have been reviewed by the Institutional Review Board, also called the IRB. The IRB is a committee of professionals who role is to ensure that the methods we use are safe.

Other tasks are like computer or performance games, such as a competitive reaction-time game against a computer program that also involves electrical stimulation that will be completely under your control.

Everything you tell us will be, of course, completely confidential. We'll tell you more about this when we see you.

When you come to the laboratory, be sure that you have not used alcohol or any recreational drugs for 24 hours before your appointment. As I mentioned, we will ask you about alcohol and recreational drug use, as well as other medications at the beginning of the laboratory session.

We'll also call you the day before the study to remind you about your appointment and to see if it is still convenient for you to participate. We will compensate you for your time at $15 per hour, up to $30 if you complete the two-hour study.

Keeping all that I told you in mind, would you like to volunteer for the study?" (If yes) "Great! We'll give you more details about the study when we see you. What would be some convenient days and times for you to come in?" **(get a list of availabilities)**

"Okay. Let's schedule you for a time to come in. Please know that we will ask you about potential COVID-19 symptoms and exposure before the study. If you come in close contact with anyone with confirmed COVID-19 virus who is still in their isolation period or has symptoms or close contact with anyone who is waiting for their COVID-19 test results 2 weeks prior to the scheduled session, or if you have had a fever and cough or shortness of breath or generally feeling unwell 24 hours before the scheduled session that cannot be explained by another physical illness, we will not be able to have that session. Please call and let us know before the session so that we can work with you to reschedule for another time."

APPOINTMENT:

Day _____

Time _____

You will come to Magruder Hall at MSU, room 100. Now how do you plan on getting to and from the here on that day?" . Great!" **(If necessary)** "I'll reserve a parking space for you (tell them where)."

"Also, what is a good time of the day to get in touch with you if I need to speak with you? Can I leave a message?" **Yes No**

(Include extra information that the participant may give you about leaving a message:)

_____.

“Okay, we have an appointment. One final item; I will be expecting you on (DATE) at (TIME). Please be prompt, because I have to stagger the times slightly so other people interested in the study don’t run into each other. I look forward to seeing you. If there are any problems, please let me know immediately. You can reach me at (662) 325-7597 and leave a message for Matthew.”

APPENDIX D

IRB APPROVAL

From: nrs54@msstate.edu

Sent Date: Tuesday, December 15, 2020 14:56:48 PM

To: meb636@msstate.edu, ad2245@msstate.edu, kja3@msstate.edu, lnm269@msstate.edu, mat306@msstate.edu, msp362@msstate.edu, nb179@msstate.edu, rkn40@msstate.edu, sa613@msstate.edu

Cc:

Bcc:

Subject: Do Not Reply: Approval Notice for Study # IRB-17-049, Pain Perception and Performance

Message:

Protocol ID: IRB-17-049
Principal Investigator: Mitchell Berman
Protocol Title: Pain Perception and Performance
Review Type: FULLBOARD
Approval Date: December 09, 2020
Expiration Date:December 08, 2021

This is a system-generated email. Please DO NOT REPLY to this email. If you have questions, please contact your HRPP administrator directly.

The above referenced study has been approved. *For Expedited and Full Board approved studies, you are REQUIRED to use the current, stamped versions of your approved consent, assent, parental permission and recruitment documents.*

To access your approval documents, log into myProtocol and click on the protocol number to open the approved study. Your official approval letter can be found under the Event History section. All stamped documents (e.g., consent, recruitment) can be found in the Attachment section and are labeled accordingly.

If you have any questions that the HRPP can assist you in answering, please do not hesitate to contact us at irb@research.msstate.edu or 662.325.3994.

Please take a minute to tell us about your experience in the survey below. When logging in, please use your MSU email (ex: abc123@msstate.edu) and login credentials:
https://forms.office.com/Pages/ResponsePage.aspx?id=sNtR7YavokWcl3P7OTXfF9uShqNaQAdClfXwiCnibYZURUtWVDRRN1pRMEhHUzBCT1RGUFRZRkdLSy4u

APPENDIX E

DOCUMENT SUPPORTING INFORMED CONSENT

Mississippi State University

Informed Consent Form for Participation in Research

IRB Approval Number: (17-049)

Title of Research Study: Pain Perception and Performance

Study Site: Mississippi State University, Department of Psychology

Researchers: Mitchell E. Berman, Ph.D.; Matthew A. Timmins, M.S.; Suzanne C. Amadi, M.S.; Nathan Barclay, B.S.; Richard K. Nelson, M.S.; Michaela Patoilo, B.S.; Lissa Mandell, B.S.; Michael R. Nadorff, Ph.D.; Kevin J. Armstrong, Ph.D.; Michael S. McCloskey, Ph.D.

Participant Code: _____

Purpose

The purpose of this research is to see if your perception of pain is related to your performance on behavioral tasks and personality characteristics.

Procedures

You must be at 18-35 years old and in good health to participate in this study. You must be able to speak and read English well enough to follow the directions of the study. You must have no history of seizures, nerve disease, cardiac disease, recent significant injury to your non-dominant hand, or any other medical condition for which electric stimulation or blunt pressure are contraindicated. You have also been asked to refrain from alcohol use and recreational drugs for 24 hours prior to this laboratory session.
After we complete this informed consent process, we will ask you to complete a brief checklist of medications that you have recently used, as well as recent cannabis and alcohol use.

If you choose to participate in this study, you will be asked to first complete a series of questionnaires. This will take about 45 to 60 minutes. The questionnaires include some items that are sensitive in nature, including questions about your health, pain sensitivity, personal behaviors, and personality that might help explain differences in performance on the tasks.

After your complete the questionnaires, we will use a device called an "algometer" to measure your pain perception. This will take about 5 to 10 minutes to do. An algometer is a standard laboratory test in which a small metal plunger is placed on the back of the hand that you use less frequently. A researcher will slowly increase the pressure until you indicate that it is painful. This procedure will be repeated several times and we will stop each time when you indicate the pressure is too uncomfortable or painful to continue, or you reach the maximum level of pressure allowed by the device. A computer program will then analyze your overall pain perception, and during the laboratory session we will show you the algometer results.

We will next get a second measure of your pain perception using electrical stimulation. We will gently clean the tips of your index and middle fingers using alcohol swabs and an emery cloth or board to get rid of any dirt, lotion, or cosmetics on your fingertips. Two small electrodes will then be attached to your fingertips using Velcro strips. Pain perception will be measured by first administering a very low level of stimulation, and slowly increasing the intensity of the stimulation. You will tell us when you first notice the stimulation. We will then stop the stimulation when you tell us that the shock is too uncomfortable or painful to continue, or you reach the maximum level of stimulation allowed by the device.

The next task involves a competitive reaction-time game against a computer. The computer has been programmed to simulate the average reaction time of someone about your age. On each reaction time competition, you will be asked to set a level of shock that you will receive if you lose to the computer, ranging from 0 (no shock) through 10 then 20 (high shock). The 10 shock will be equal to your electrical stimulation pain threshold that we just determined. The 20 shock will be twice this threshold and can cause minor tissue damage that will quickly heal. This task will take about 20 minutes to complete.

You will then complete a second motor performance task that will take about 15 minutes to do. After that we will have some brief questionnaires for you to fill out. With breaks between activities, the entire process today will take around two hours. After you are done with all these activities, we will chat briefly to get your impressions of the study and compensate you for your time (up to $30).

Risks or Discomforts

Because the questionnaires include some items that are sensitive in nature, if you are at all distressed as you are working on these, please immediately inform the researcher.

You may also experience some discomfort or pain from the pressure and electrical stimulation used to measure pain perception. However, you will determine the maximum amount of stimulation that you say is your pain threshold.

Benefits

The information obtained in this study will not directly benefit you. However, the results of the study may provide information about pain perception and human behavior. Given that we all experience pain at some point in our lives, this information could help researchers to better understand the experience of pain and how to best treat pain.
Participants who want to learn more about the results of the study will be invited to provide their contact information to be notified about a group meeting to go over the results.

Incentive to participate

You will receive $15 dollars for each hour of participation in the study. Thus, you will be compensated $30 for the two study hours. Should you withdraw from the study before completion, the amount of compensation for your time will be prorated based on to the actual time you spent on the study, rounded up to the next hour. For example, if you spend 20 minutes participating in the study and decide to stop, you will still receive $15.

Alternatives

Participation in this study is voluntary, and there is no penalty for choosing not to participate.

Confidentiality

Your involvement in this project will be kept confidential. Your data will be recorded using an unidentifiable code, so your name and identifying information on the informed consent will not be stored with your data. In any presentations or papers that result from this study, data will be reported in aggregate form only. This informed consent (along with your contact information for an optional group informational meeting to which you will be invited) will be stored in a separate locked cabinet and will be stored for at least 10 years or as long as the researchers continue to use the data to publish peer reviewed articles. The purpose of the group meeting will be to discuss the results of this study and to answer any questions about the study for participants who have an interest.

Please note that these records will be held by a state entity and therefore are subject to disclosure if required by law. Research information may be shared with the MSU Institutional Review Board (IRB) and the Office for Human Research Protections (OHRP) and others who are responsible for ensuring compliance with laws and regulations related to research. The information from the research may be published for scientific purposes; however, your identity will not be given out.

Thank you for agreeing to participate in our research. Before you begin, please note that the unidentified data you provide may be collected and used by Qualtrics as per its privacy agreement. Additionally, this research is for residents of the United States over the age of 18; if you are not a resident of the United States and/or under the age of 18, please do not participate in this study.

Note that Qualtrics has specific privacy policies of their own. You should be aware that these web services may be able to link your responses to your ID Code in ways that are not bound by this consent form and the data confidentiality procedures used in this study. If you have concerns, you should consult these services directly.

Questions

If you have any questions about this research project or want to provide input, please feel free to contact Matthew A. Timmins, M.S. at (662) 325-7597. You can also contact Mitchell E. Berman, Ph.D. at (662) 325-3202.

For questions regarding your rights as a research participant or to request information, please feel free to contact the MSU Human Research Protection Program (HRPP) by e- mail at irb@research.msstate.edu, or visit our participant page on the website at http://orc.msstate.edu/humansubjects/participant/.

To report problems, concerns, or complaints pertaining to your involvement in this research study, you may do so anonymously by contacting the MSU Ethics Line at http://www.msstate.ethicspoint.com/.

Research-related injuries

You can contact the Mississippi State Student Counseling Services if you are a student here (662-325-2091), the National Hotline for Suicide Prevention (1-800-273-8255), or your primary health care provider if any concerns arise after completing the study. MSU has not provided for any payment to you or for your treatment if you are harmed as a result of taking part in this study.

In addition to reporting an injury to Matthew A. Timmins, M.S. at 662-325-7597 and to the Research Compliance Office at 662-325-3994, you may be able to obtain limited compensation from the State of Mississippi if the injury was caused by the negligent act of a state employee where the damage is a result of an act for which payment may be made under §11-46-1, et seq. Mississippi Code Annotated 1972. To obtain a claim form, contact the University Police Department at MSU UNIVERSITY POLICE DEPARTMENT, Williams Building, Mississippi State, MS 39762, (662) 325-2121.

Voluntary Participation

Please understand that your **participation is voluntary**. **Your refusal to participate will involve no penalty or loss** of benefits to which you are otherwise entitled. You **may discontinue your participation** at any time without penalty or loss of benefits.

Options for Participation

Please initial your choice for the options below:

___The researchers may contact me again to discuss the results of the study in a group setting.

___The researchers may NOT contact me again.

Please take all the time you need to read through this document and decide whether you would like to participate in this research study.

If you agree to participate in this research study, please sign below. You will be given a copy of

_____ _____
Participant Signature Date

_____ _____
Investigator Signature Date

Research Participant Satisfaction Survey

In an effort to ensure ongoing protections of human subjects participating in research, the MSU HRPP would like for research participants to complete this anonymous survey to let us know about your experience. Your opinion is important, and your responses will help us evaluate the process for participation in research studies. https://www.surveymonkey.com/r/M5M95YF

APPENDIX F

COVID-19 SCREENING

IRB Required COVID-19 Screening

Hand the scheduled participant a copy of the COVID-19 screening questions sheet while at the door.

Ask the scheduled participant, "Would you say yes to any of these questions?"

DO NOT record any responses to questions in this box.

- In the past 2 weeks, have you been in close contact with anyone with confirmed COVID-19 virus who is still in their isolation period or still has symptoms?
- In the last 2 weeks, have you been in close contact with anyone who is currently waiting their COVID-19 test results?
- Have you had a fever and cough within the last 24 hours that you cannot attribute to another known health condition?
- Have you had a shortness of breath within the last 24 hours that you cannot attribute to another known health condition?
- Do you feel generally unwell for any reason? For example. Do you have a new unexplained muscle aches, new sore throat, new GI distress or other new changes in your health that you cannot attribute to another known health condition or specific activity?

1) If YES to any of the COVID-19 Screening:
    - "Unfortunately, do to MSU COVID-19 protocols, we will have to reschedule your session. Please call us again in 2 weeks if you have not had any of those symptoms and have not been in close contact with someone who may have COVID-19. We can reschedule you at that time. We strongly encourage any potential participants who are concerned about exposure to COVID-19 or symptoms related to COVID-19 to contact their primary care doctor."
    - End the protocol and inform Timmins, Berman, and/or Amadi after the potential participant leaves.
2) If NO to ALL of the Covid-19 Screening, continue with the protocol.

APPENDIX G

COMPLETE LIST OF SELF-REPORT MEASURES

1. Demographics and Health Questionnaire
2. Alcohol Use Disorders Identification test (AUDIT; Sanders et al., 1993)
3. Deliberate Self-Harm Inventory (DSHI; Gratz, 2001)
4. Life History of Aggression Scale (LHA; Coccaro et al., 1997)
5. Pittsburgh Sleep Quality Index-19 (PSQI-19; Buysse et al., 1989)
6. Quick Inventory of Depressive Symptomology – Self-Report (QIDS-SR; Rush et al., 2003)
7. Pain Sensitivity Questionnaire (PSQ; Ruscheweyh et al., 2009)
8. Post-Traumatic Stress Disorder (PTSD) Checklist for DSM-5 (PCL-5; Blevins et al., 2015)
9. Difficulties with Emotion Regulation Scale – 18 (DERS-18; Victor & Klonsky, 2016)
10. Buss-Perry Aggression Questionnaire (BPAQ; Buss & Perry, 1992)
11. Short Version of the Urgency, Premeditation (lack of), Perseverance (lack of), Sensation Seeking, Positive Urgency, Impulsive Behavior Scale (SUPPS-P; Cyders et al., 2014)
12. McLean Screening Instrument for Borderline Personality Disorder (MSI-BPD; Zanarini et al., 2003)
13. Suicidal Ideation Attributes Scale (SIDAS; van Spijker et al., 2014)
14. Pain Catastrophizing Questionnaire (PCQ; Osman et al., 1997)