Running Head: PAIN, NSSI, AND SUICIDE RISK

Subjective Pain during NSSI as an Active Agent in Suicide Risk

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Abstract

Non-suicidal self-injury (NSSI) has been identified as a correlate of suicidality and a predictor of suicidal ideation and attempts. Given the high rates of NSSI presence among adolescents and young adults, it is important to identify specific characteristics of NSSI that might place individuals who engage in this behavior at highest risk for suicidal behaviors. NSSI is thought to increase the acquired capability for suicide via habituation to self-harm, though the NSSI characteristics most responsible for this relationship are unclear. The current study examined three characteristics of NSSI (frequency, number of methods, and subjective pain) that may help to elucidate this risk relationship. Young adults ($N = 997$) with a history of NSSI completed measures assessing lifetime NSSI frequency, number of NSSI methods employed, and subjective experience of pain during NSSI, as well as suicide attempt (SA) history. Results indicated that NSSI frequency, number of NSSI methods, and subjective pain experienced during NSSI were each positively associated with a SA history. Further, subjective pain experienced during NSSI moderated the relationship between NSSI frequency and SA history, such that the association between NSSI frequency and SA history was stronger for individuals who experienced greater subjective pain.

Key words: non-suicidal self-injury, suicide attempts, pain, acquired capability

1. Introduction

Suicide is the third leading cause of death among 10-24 year olds (Nock et al., 2013) and is a serious public health concern. Suicidal behaviors refer to any behaviors engaged in with any intent to die (e.g., suicidal attempts [SA]) (Nock & Favazza, 2009). Non-suicidal self-injury (NSSI) is a related, but distinct, construct; NSSI is defined as the intentional self-injury of one's tissue *without* any associated intent to die (Klonsky & Muehlenkamp, 2007; Nock, 2009). Importantly, NSSI has been identified as a strong correlate of suicidality (Andover & Gibb, 2010; Klonsky, May, & Glenn, 2013), and further, as a predictor of future suicidal ideation and attempts (Hamza et al., 2012; Whitlock et al., 2013; Wilkinson et al., 2011). Given this link, and the high rates of NSSI presence among adolescents and young adults (e.g., 10-51%; Hilt, Cha, & Nolen-Hoeksema, 2008; Ogle & Clements, 2008), it is important to identify the specific characteristics of NSSI that place individuals who engage in this behavior at highest risk for SA, thus better informing the direction of resources.

According to Joiner (2005), in order to engage in suicidal behavior one must not only have a strong desire for suicide, but also must have an *acquired capability* for suicide. This acquired capability can be attained through painful and traumatic experiences, or specific behaviors, such as NSSI (Van Orden, Witte, Gordon, Bender, & Joiner, 2008; Anestis, Bagge, Tull, & Joiner, 2011). This acquired capability theory of suicide suggests that NSSI predisposes one to be at greater risk for SA via habituation to the pain and fear needed to carry out suicidal acts (Joiner, 2005). Preliminary research is supportive of this theory and the implication for the NSSI – SA relationship (Franklin et al., 2011; Stanley et al., 2001). For example, individuals who endorse low sensitivity to pain and greater acquired capability for suicide are more likely to report a history of SA (Van Orden et al., 2008). Individuals with a history of NSSI report higher

pain tolerance and greater acquired capability for suicide than those without a history of NSSI (Franklin et al., 2010; Hooley et al., 2010). Furthermore, individuals with a history of both NSSI and SA were more confident in their competency and courage to be able to carry out a lethal SA compared to suicide attempters without a history of NSSI (Stanley et al., 2001).

If NSSI reduces one's hesitancy to engage in SA, then the greater frequency with which one engages in NSSI, the more powerful the erosion of the fear and pain associated with enacting a lethal SA. The majority of extant research indicates that NSSI frequency is indeed associated with SA (Andover & Gibb; Darke et al., 2010; Paul et al., 2015), such that engaging in more NSSI acts is related to greater risk of exhibiting suicidality. However, a few studies have suggested a relationship inconsistent with these findings. It was found that SA risk may increase up to a certain point among those engaging in NSSI (e.g., 50 incidents of NSSI), but decrease thereafter (Paul et al., 2015; Whitlock & Knox, 2007). Moreover, it also has been suggested that there is no relationship between the frequency of NSSI behavior and risk for SA (Nock et al., 2006). Research is thus needed to clarify the relationship between NSSI frequency and suicide attempt risk, particularly given its theoretical relevance to the Acquired Capability for Suicide theory (Joiner, 2005).

Among those who engage in NSSI, employing a greater number of NSSI methods may also influence habituation to fear and pain. Engaging in numerous NSSI methods could lead to more diverse painful and provocative experiences, aiding in the erosion of fear for several forms of pain, which is thought of as a natural barrier to suicide (Joiner, 2005; Victor & Klonsky, 2014). Moreover, using several NSSI methods may influence the development of versatility in willingness and ability to engage in self-inflicted harm (Victor & Klonsky, 2014). Several studies have found that a greater number of NSSI methods predict suicidal behavior (Victor &

Klonsky, 2014). In fact, a recent meta-analysis found a moderate effect size for the number of NSSI methods as a correlate of SA, surpassing the effect of various psychopathologies (Victor & Klonsky, 2014).

In addition to the strong evidence for increased risk of SA among those with greater NSSI frequency and employed methods, research has directly tested the influence of pain in the association between NSSI and SA. Supporting the Acquired Capability for Suicide theory, individuals with a history of NSSI, compared to those without, demonstrated higher pain thresholds and endured pain for longer (e.g., pain tolerance) (Hooley et al., 2010; Germain & Hooley, 2013). The specific variable of pain tolerance, as opposed to pain threshold (time elapsed from onset of pain stimuli to experience of pain) or perceived pain intensity, has been postulated as an important factor in pain habituation as it relates to acquired capability (Franklin et al., 2011; Van Orden et al., 2010). Despite the preliminary support for the particular importance of lab-measured pain tolerance in the acquired capability for suicide, there has been some research, although limited, suggesting that the role of subjective pain experienced during NSSI acts may be equally important in measuring acquired capability. In examining subjective pain, individuals who reported an absence of pain during NSSI had a history of twice as many SAs as those reporting any pain during NSSI, suggesting that individuals experiencing an absence of pain might have an extremely elevated habituation to pain, signifying a heightened acquired capability for suicide (Nock et al., 2006). This is the only study to our knowledge, however, that has directly examined the role of subjective pain during NSSI and its relationship with SA.

Although there is a dearth of literature in this area, research has indirectly indicated mixed evidence regarding the relationship between subjective pain experienced during NSSI and

SA. Klonsky and Olino (2008) identified classes of self-injurers based on NSSI methods, functions, and additional descriptive features (e.g. pain analgesia). It was found that one class of self-injurers who had a greater proportion of members endorse a SA history also had the *lowest* proportion of individuals that endorsed pain analgesia. One potential reason for these conflicting findings is that many studies were limited by their dichotomous measure of subjective pain experience (absence versus presence) when research indicates that self-injurers experience a wide range of pain presence during NSSI episodes (Lindholm et al., 2011). Therefore, there is potentially a more nuanced relationship between degree of pain experienced and SA history that may better inform the Acquired Capability for Suicide hypothesis.

1.1 Current Study

Utilizing the Acquired Capability for Suicide theory three main characteristics of NSSI have been identified that may influence the role of NSSI engagement in the habituation to the fear and pain required to commit SAs: NSSI frequency, number of NSSI methods, and subjective pain experienced during NSSI acts. Although there is a strong literature demonstrating a predictive relationship between NSSI frequency and SA (Andover & Gibb; Darke et al., 2010; Paul et al., 2015), it does not account for all variability in the presence of SA; thus, it is important to consider the number of NSSI methods used and pain experienced during NSSI as they relate to SA (Joiner, 2005; Klonsky & Olino, 2008; Van Orden et al., 2010; Victor & Klonsky, 2014). As such, in the current study we hypothesized that each of these three characteristics would individually be associated with SA. We further hypothesized that the number of NSSI methods employed would significantly moderate the relationship between NSSI frequency and SA, such that a greater number of methods would amplify the association between

NSSI frequency and SA. We also conducted an exploratory examination of subjective pain as a potential moderator of the association between NSSI frequency and SA.

2. Method

2.1 Participants

Participants were 997 undergraduate students from a large urban university. All participants endorsed having engaged in at least one act of NSSI throughout their lifetime. Participants were classified as having a history of SAs if they endorsed at least one SA throughout their lifetime ($n = 128$). Participants (67% female) were aged 18-41 ($M = 20.64$, $SD = 2.88$). Approximately 66% of the sample identified as Caucasian, 9% African American, 11% Asian, 6% identified as biracial, 5% identified as “other” and 3% indicated they preferred not to answer.

2.2 Measures

2.2.1 Non-suicidal self-injury. The presence of NSSI was assessed with the Forms and Functions of Self-Injury (FAFSI; Jenkins, Connor & Alloy, 2011). The FAFSI is a self-report measure consisting of two sections. Only the first section was used in the current study, which inquires about 13 different forms, or methods, of NSSI, in addition to participants’ subjective experience of NSSI. Participants are asked if they have engaged in several NSSI behaviors and the number of times they have engaged in each method throughout their lifetime. Potential NSSI acts included cutting self, carving skin, burning self, banging head, and inserting objects into skin, in addition to seven other behaviors. In order to reduce variability in NSSI frequency estimates, number of lifetime NSSI acts were categorized (Whitlock et al., 2013; Burke et al., 2015) by the following frequencies: 1 act, 2-4 acts, 5-10 acts, 11-20 acts, 21-49 acts, and 50 or more acts. Participants also were asked about their subjective experience of pain during NSSI

(“In general, how much pain do you experience when you hurt yourself?”). Response options consisted of: 1 = *no pain*; 2 = *a little pain*; 3 = *moderate pain*; 4 = *severe pain*. The internal consistency of the FAFSI has been supported (Jenkins et al., 2011). In the current sample, the internal consistency of NSSI behavior was strong ($KR-20 = .81$).

2.2.2 SBQ-R. The Suicide Behavior Questionnaire – Revised (SBQ-R; Osman et al., 2001), a 4-item self-report measuring dimensions of suicidality, was used to assess the presence of SAs. Only the item regarding lifetime SAs was used in the current study (e.g., “I have attempted to kill myself.”). The measure’s internal consistency has been established in an undergraduate sample, $\alpha = .76$ (Osman et al., 2001).

2.3 Procedures

Participants completed a series of self-report measures as part of a larger study on aggression and self-aggression on a secure website. All participants provided informed consent and received course credit for their participation.

3. Results

3.1 NSSI Characteristics

On average, participants reported engaging in 2.1 different NSSI methods (range = 1-11, $SD = 1.63$). The most common NSSI method reported was cutting self (46%), followed by banging head (35%), pinching self (21%), scratching/scraping self (18%), and burning self (17%). The mean level of subjective pain reported among participants was 2.16 ($SD = .74$). Participants’ lifetime NSSI acts were categorized into the following six frequency categories: 1 act ($n = 129$), 2-4 acts ($n = 240$), 5-10 acts (211), 11-20 acts ($n = 132$), 21-49 acts ($n = 116$), and 50 or more acts ($n = 169$). Participants in each NSSI frequency category also were compared on demographic variables using one-way ANOVAs and χ^2 . Gender varied across NSSI groups, $\chi^2(5,$

$N = 997$) = 11.52, $p = .05$, with follow-up χ^2 showing those with 50 or more acts of NSSI were more likely to be female. NSSI groups varies with respect to race, $\chi^2 (15, N = 978) = 29.98, p = .01$, with follow-up χ^2 showing a higher proportion of white versus non-white participants in 21-49 and 50+ groups than in the other NSSI groups. There were no significant differences between groups on age, $F (5, 991) = 1.50, p = .19$.

Differences in number of NSSI methods and subjective pain also were compared between the six frequency categories, controlling for gender. There were group differences found on number of NSSI methods used, $F (5, 991) = 74.06, p < .001, \eta^2 = .058$. Post hoc Tukey HSD tests revealed significant differences between all groups, except between those with 1 act and 2-4 acts ($p = .28$). There were group differences found on subjective levels of pain as well, $F (5, 991) = 13.17, p < .001, \eta^2 = .07$. Post hoc Tukey HSD tests revealed significant differences between all groups, except between those with 1 act and 2-4 acts ($p = .10$), those with 5-10 acts and 11-20 acts ($p = .87$), and between those with 21-49 acts and 50 or more acts ($p = .27$). Participants in the higher level NSSI frequency categories reported using a greater number of NSSI methods and experiencing higher levels of subjective pain during NSSI. See Table 1 for means and standard deviations.

3.2 Preliminary Results

Initial correlational analysis of the study variables showed that all variables were significantly correlated (r 's = .19-.64, all p 's < .05). Individuals with and without a history of SAs were compared on demographic variables. Individuals with a history of SAs were more likely to be female (79% female), $\chi^2 (1, N = 997) = 7.89, p = .01$, and older ($M = 21.53, SD = 3.92$), $t (995) = -3.94, p < .001$, compared to those without a history of SAs (66% female; age M

= 20.48, $SD = 2.63$), There were no significant differences in race between SA groups, $\chi^2(4, N = 978) = 9.03, p = .06$.

3.3 Suicide Attempt History and NSSI Variables

Differences in NSSI characteristics were compared between participants with and without a history of SA, controlling for both gender and age. There were significant differences in NSSI frequency between those with and without a history of SAs, $F(1, 994) = 3.06, p = .03, \eta^2 = .46$. Post hoc Tukey HSD tests revealed that individuals with 50+ acts of NSSI were more likely to have a SA history than those with 1 act ($p < .001$), 2-4 acts ($p < .001$), or 5-9 acts ($p = .001$). Similarly, those with 21-49 acts were more likely to have a SA history than those with 1 act ($p = .002$), 2-4 acts ($p = .001$), or 5-9 acts ($p = .02$). Individuals with 11-20 acts of NSSI were more likely than those with 2-4 acts ($p = .03$) to have a history of SAs. Those with a history of SAs were more likely to have engaged in a greater number of NSSI methods, $F(1, 994) = 5.54, p < .001, \eta^2 = .63$, and were more likely to experience greater subjective pain during NSSI, $F(1, 994) = 13.17, p = .01, \eta^2 = .88$, compared to those without a SA history. See Table 2.

Given the significant associations between the number of NSSI methods and subjective pain with NSSI frequency and SA history, in addition to NSSI frequency with SAs, a path analysis model including all study variables was tested. The model assessed both number of NSSI methods and subjective pain as moderators of the relationship between NSSI frequency and SA history, while controlling for gender and age. The direct effect of NSSI frequency ($p = .01$), number of NSSI methods ($p < .001$), and subjective pain ($p < .001$) on SA history were all still significant; participants with greater NSSI frequency, greater number of NSSI methods, and greater subjective pain during NSSI were all more likely to have a history of SAs. Subjective pain was a significant moderator of the relationship between NSSI frequency and SA history ($p =$

.03), with heightened pain during NSSI strengthening the negative association between NSSI frequency and SA (see Figure 1). Number of NSSI methods showed a similar, albeit non-significant trend towards moderating the relationship between NSSI frequency and SA history ($p = .06$). See Table 3.

4. Discussion

Consistently, the literature has evidenced NSSI as a primary risk factor for suicidal behavior (e.g., SAs) (Hamza et al., 2012). Theory has suggested that this risk relationship is due to the ability of NSSI acts to cultivate habituation to fear and pain to the degree necessary for undertaking lethal, suicidal acts (Joiner, 2005). The current study aimed to explore three main factors that likely play a role in developing this acquired capability for suicide: NSSI frequency, number of NSSI methods employed, and subjective pain experienced during NSSI. Supporting the study's hypotheses, each of these three factors was associated with the presence of SA. Further, results demonstrated that the subjective pain experienced during NSSI moderated the relationship between NSSI frequency and the presence of a SA.

When considering both number of NSSI methods and subjective pain as moderators of the relationship between NSSI frequency and SAs, only the subjective pain experienced during NSSI was a significant moderator. Specifically, we found that experiencing a heightened degree of pain during NSSI amplifies the relationship between NSSI frequency and SA. This suggests that the experience of pain during NSSI may serve as a driving factor in acquiring the necessary capability for suicide, and that the experience of pain is a necessary ingredient for eroding the fear of pain. Interpreting the findings in this light, it is possible that habituation to the *fear* of pain is more important than the erosion of the painful experience itself (i.e., through repetition) in acquiring the ability to enact a lethal desire. According to the results, those who engaged in

NSSI relatively fewer times, but with greater pain during those episodes, made up the group at greatest risk for a SA. There has been ample research indicating that greater NSSI frequency is a significant risk factor for SAs (e.g., Paul, Tsypes, Eidlitz, Hernhout, & Whitlock, 2015; Victor & Klonsky, 2014), but the current findings add to this literature, suggesting that NSSI engagement may result in increased acquired capability even at a low NSSI frequency *if* a high degree of pain is experienced during these acts. Given the increased levels of pain in NSSI, even at initial NSSI engagement, these individuals may habituate to the pain, or the fear associated with pain, at a faster rate, increasing their capability to engage in suicidal behavior.

Unexpectedly, individuals who experienced higher pain during NSSI and engaged in NSSI at a higher frequency demonstrated a lessened risk for SA as compared to those with higher pain and *lower* frequency. This finding seems to conflict with the theorized relationship of NSSI frequency and SA, as suggested by the theory of Acquired Capability for Suicide. It is possible that NSSI may work differently, or serve a different purpose, for individuals who engage in NSSI at both a heightened frequency and with high levels of pain. For example, it could be hypothesized that this group may experience greater affective relief during NSSI, and so they may be less likely to move to more lethal acts (e.g., SA). It is also possible, however, that these individuals have reached their “maximum” level of habituation to pain and fear. Two previous studies have found that the association between NSSI frequency and SA increases until an individual has engaged in 50 acts of NSSI, and then declines thereafter, suggesting a curvilinear relationship (Paul et al., 2015; Whitlock & Knox, 2007). This pattern may be so strong that it persists even after considering the role of pain in the relationship, suggesting that higher levels of subjective pain during NSSI is a driving risk factor for SA, but only until individuals hit a “ceiling” in regards to NSSI frequency. These hypotheses need to be further

explored in future research, but could have important clinical implications in detailing suicide risk among those engaging in NSSI at a high frequency.

The current findings are inconsistent with findings that the absence of pain during NSSI was associated with increased suicide risk (Nock et al., 2006). It is possible that these differences in findings are due to the fact that Nock and colleagues (2006) examined pain during NSSI as dichotomous (present versus absent), whereas the current study analyzed subjective pain on a continuum. However, when examining the current sample with the former dichotomous pain framework, we did not attain similar results. That is, individuals who reported experiencing no pain during NSSI, compared to those who reported *any* pain, were *not* more likely to report a history of SAs. Another potential factor underlying the inconsistent findings is that Nock and colleagues (2006) examined this research question among a sample of adolescents in a hospital setting, representing a severe population, as opposed to the community sample utilized in the present study. Our results, however, are in line with Klonsky and Olino (2008)'s findings that were similarly conducted with a young adult non-clinical sample. Therefore, the current study suggests that the experience of pain during NSSI may play a different role for those engaging in NSSI at a clinical level, as opposed to a community sample of self-injurers.

Contrary to our hypotheses, number of NSSI methods did not serve as a significant moderator of the relationship between NSSI frequency and SAs, but was trending towards significance ($p = .06$). It is possible that individuals who engage in NSSI more frequently and with a wider variety of methods may be at an increased risk for SAs due to erosion of painful experiences through multiple pathways. Although not reaching significance in the current sample, this relationship should be explored in future research. Number of NSSI methods was significantly associated with the presence of SAs, even after considering the role of NSSI

frequency and the experience of subjective pain in the model. Results indicate that number of NSSI methods and NSSI frequency may operate as distinct mechanisms in acquiring the capability for suicide. It is possible that individuals with a high frequency of NSSI and low number of methods are still at an increased risk for SAs. And, in turn, those with a high number of methods, regardless of frequency, are similarly at a high risk for SA. Furthermore, the strength of the pathway from NSSI methods to SAs was greater than the pathway from NSSI frequency to SAs. These findings are consistent with those from a recent meta-analysis finding that the number of NSSI methods employed had a slightly larger effect size in predicting SAs than did NSSI frequency (Victor & Klonsky, 2014).

4.1 Limitations

The findings from the current study must be interpreted with an understanding of its limitations. For example, the cross-sectional nature of the current data precludes us from determining the temporal relationship between NSSI and SAs. Consequently, any causal interpretations of the current findings, such that these NSSI characteristics fostered the development of acquired capability for a later SA, must be tested in a longitudinal design in order to be substantiated. Furthermore, the study relied solely on self-reported levels of all constructs measured. Whereas the subjective experience of pain during NSSI is inherently a self-reported perception, only one item was used to assess this construct. This item required individuals to report the pain they experience “in general” when engaging in NSSI, which requires some individuals to lump potentially hundreds of experiences together to derive an overall rating. It is possible that for some individuals, a majority of past acts of NSSI were not painful at all, whereas a few notable acts might have been extremely painful, leading to a biased average rating of pain. Although the current findings have shed light on the potential impact of

subjective pain in suicide risk, future studies would benefit from observing pain levels over time, and gathering more nuanced information about the onset and duration of pain.

4.2 Clinical Implications

The current study has implications for suicide risk assessment among individuals engaging in NSSI. Importantly, findings from the current study demonstrate that the level of subjective pain experienced during NSSI may be a highly clinically relevant NSSI characteristic to consider in suicide risk assessment. Our results strongly suggest that it may be important to assess for pain experienced during NSSI, particularly among those who have only sparingly engaged in the behavior and may otherwise have been assessed as having low risk for suicidal behavior. Our finding that although both number of NSSI methods and NSSI frequency were independently predictive of SA presence but did not significantly interact, suggests that each of these NSSI characteristics should be considered independently when quantifying risk. For example, an individual who has engaged in many methods but only very few times for each, may still be at high risk for suicidal behavior despite low overall frequency.

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TABLES

*Table 1**NSSI characteristics as a function of NSSI Frequency*

	1 Act (n = 129)	2-4 Acts (n = 240)	5-10 Acts (n = 211)	11-20 Acts (n = 132)	21-49 Acts (n = 116)	50+ Acts (n = 169)
NSSI Methods	1.00 (.00)	1.26 (.46)	1.71 (.88)	2.61 (1.21)	3.12 (1.37)	3.86 (2.23)
Subjective Pain	1.87 (.77)	1.99 (.71)	2.18 (.70)	2.19 (.63)	2.47 (.68)	2.38 (.77)

Note: NSSI methods = number of different NSSI methods used

Table 2

NSSI characteristics as a function of suicide attempt status

	No SA (N = 869)	SA (n = 128)	Test Statistic
NSSI Frequency	3.25 (1.64)	4.22 (1.60)	3.06*
NSSI Methods	1.92 (1.44)	3.4 (2.19)	5.54***
Subjective Pain	2.12 (.70)	2.52 (.86)	13.17**

Note: *** $p < .001$; ** $p < .01$; * $p < .05$; NSSI = non-suicidal self-injury; SA = suicide attempt(s); NSSI methods = number of different NSSI methods used.

Table 3

Path analysis predicting suicide attempt status

	Coefficient	95% CI
Age	.11 (.03) ***	.05 - .17
Gender	.43 (.24)	-.05 - .90
NSSI Frequency	.64 (.24) **	.17 – 1.12
NSSI Methods	.81 (.24) ***	.33 – 1.29
Subjective Pain	1.33 (.38) ***	.58 – 2.07
NSSI Frequency x Method	-.08 (.04)	-.17 - .004
NSSI Frequency x Pain	-.19 (.09)*	-.36 - .02

Note: Unstandardized coefficients are presented; *** $p < .001$; ** $p < .01$; * $p < .05$; NSSI methods = number of different NSSI methods used.

Figure 1

Suicide risk as a function of subjective pain x NSSI frequency