CHARACTERISTICS AND CONSEQUENCE OF NON-SUICIDAL SELF-
INJURY DISCLOSURE

A Dissertation
Submitted to
the Temple University Graduate Board

In Partial Fulfillment
of the Requirements for the Degree
DOCTOR OF PHILOSOPHY

By
Brooke A. Ammerman
August 2018

Examining Committee Members:

Michael McCloskey, Ph.D., Advisory Chair, Dept. of Psychology, Temple University

Deborah Drabick, Ph.D., Dept. of Psychology, Temple University

Thomas Olino, Ph.D., Dept. of Psychology, Temple University

Eunice Chen, Ph.D., Dept. of Psychology, Temple University

Richard Heimberg, Ph.D., Dept. of Psychology, Temple University

Evan Kleiman, Ph.D., Dept. of Psychology, Harvard University

ABSTRACT

Non-suicidal self-injury (NSSI) is linked to several adverse effects (Bentley et al., 2015; Klonsky et al., 2013; Plener et al., 2015). However, only approximately half of those engaging in NSSI ever disclose their behavior (Armiento et al., 2014; Martin et al., 2010), with less than 15% reporting they disclosed to a healthcare provider (Hasking et al., 2015). Despite the critical role of disclosure in NSSI reduction and treatment, there is a dearth of research aimed at understanding those who disclose NSSI, to whom they disclose, and the outcomes of choosing to disclose. This is, in part, due to the absence of measures that assess perceived reactions of NSSI disclosure recipients. The current project examined these facets of NSSI disclosure through two related studies. Study 1 used an undergraduate sample (*N*=452) with a history of NSSI to (1) identify factors that may discriminate between those who do and do not disclose their NSSI behavior and (2) better understand the choice of NSSI disclosure recipient. Results indicated that individuals who disclosed their NSSI reported greater inter- and intra- personal motivations for NSSI and increased rates of suicide plans and attempts; groups did not differ on NSSI severity, emotional distress vulnerabilities (e.g., distress tolerance, perceived stress, suicidal ideation), or interpersonal obstacles (i.e., social support, stigma internalization). Among those who disclosed their NSSI *(N=271)*, peers were the most common disclosure recipient. Study 2 validated a new measure of perceived social reactions upon disclosure of NSSI, the Self-Injury Social Reactions Questionnaire (SI-SRQ), and provided preliminary information about the associations between perceived social reactions and NSSI disclosure characteristics. A three-factor structure of the SI-SRQ assessing positive (tangible aid, emotional support) and negative social reactions

was supported in both an undergraduate (*N*=269) and community (*N*=217) sample.

Overall, the psychometric properties of the SI-SRQ were supported. However, findings

did not demonstrate a relationship between disclosure characteristics (i.e., peer recipient

choice, number of disclosures, involuntary disclosure) and positive or negative social

reactions. Results from the current project highlights the importance of one's social

context (i.e., facilitating converstations about mental health) on the likelihood of NSSI

disclosure and the need for more explicit discussions about NSSI engagement, facilitated

by both family members and healthcare providers. Furthermore, by examining a newly

developed measure to assess perceived reactions to NSSI disclosure, the current project

identified three main forms of social reactions an individual may receive upon disclosing

their NSSI. Although preliminary, these findings may help inform educational efforts

about responding to NSSI disclosures more effectively, such as by providing information

about counseling or other services and more general, emotional support.

ACKNOWLEDGEMENTS

First, I wish to express my sincere appreciation to Dr. Mike McCloskey for his continued support of my various research and professional endeavors throughout graduate school, including this project. I would also like to thank Dr. Tom Olino, Dr. Deb Drabick, and Dr. Eunice Chen for their patience and valuable input throughout the entirety of my dissertation.

Current and former members of the MAD Lab (Amy, Dan, Lauren, Alex, Martha, Kristen, Anne, and several undergraduate research assistants) have also played a large role in the progress of my "original dissertation" and the completion of this project. I am particularly thankful for the significant contribution(s) of the current MAD Lab members as they have provided invaluable emotional support and ensured the continuation of data collection while I have been on internship.

Finally, on a personal note, I would like to thank my family and friends for their support and encouragement throughout my complete dissertation process and, more so, graduate school. I could not have done it without the constant source of motivation and unwavering love from my husband, Dr. Ross Jacobucci, the nights spent commiserating with Dr. Amy Look, the self-care getaways with Dr. Jane Vangsness, and the care packages and words of reassurance from my mom, dad, and sister. Thank you.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

MANUSCRIPT IN JOURNAL ARTICLE FORMAT

Characteristics and Consequences of Non-Suicidal Self-Injury Disclosure

Non-suicidal self-injury (NSSI), the direct, intentional destruction of one's own body tissue without the intent to die (Klonsky & Muehlenkmap, 2007; Nock, 2009), occurs among 12%-18% of young adults (Claes, Luyckx, & Bittebier, 2014; Taliaferro & Muehlenkamp, 2015; Whitlock, Eckenrode, & Silverman, 2006). NSSI behaviors can vary from cutting and scratching /scraping one's skin to self-biting and hitting, preventing wounds from healing, and rubbing skin with sandpaper or glass; at the extreme, these behaviors may necessitate medical attention and many result in scarring (Klonsky & Muehlenkmap, 2007; Nock, 2009; Whitlock, Muehlenkamp, & Eckenrode, 2008).

Beyond physical scarring, NSSI is linked to several adversities (Bentley, Cassiello-Robbins, Vittorio, Sauer-Zavala, & Barlow, 2015; Klonsky, May & Glenn, 2013; Plener, Schumacher, Munz, & Groschwitz, 2015), including a higher likelihood of co-occurring psychopathology (e.g., depression, anxiety, suicidal behaviors; Andover, & Gibb, 2010; Bentley et al., 2015; Braga & Goncalves, 2014; Kerr & Muehlenkamp, 2010; Klonsky et al., 2013; Whitlock et al., 2013) and increased interpersonal difficulties, such as lower perceived familial and peer support (Tatnell, Kelada, Hasking, & Martin, 2014) and greater interpersonal conflict (Adrian, Zeman, Erdley, Lisa & Sim, 2011). NSSI is also linked to deficits in regulating emotional experiences (Andover & Morris, 2014; Bresin, 2014; Davis et al., 2014) and heightened emotional distress and arousal (Nock & Mendes, 2008; Plener et al., 2015). Despite these difficulties, when identified, NSSI may be reduced through psychological and pharmacological interventions (Turner, Austin &

Chapman, 2014). However, for treatment to occur the NSSI behavior typically must first be disclosed.

Characterizing NSSI Disclosures

The disclosure of emotional events and/or behaviors (e.g., NSSI) may be particularly difficult if associated with feelings of guilt and shame (Rimé, Philippot, Boca, & Mesquita, 1992), emotions that often accompany NSSI (Leibenfult, Gardner, & Cowdry, 1987; Schoenleber et al., 2014). Supporting this, only approximately half of those who engage in NSSI ever disclose their behavior (Armiento, Hamza, & Willoughby, 2014; Evans, Hawton, & Rodman, 2005; Martin, Swannell, Hazell, Harrison, & Taylor, 2010). Those who engage in NSSI fear that disclosing their behavior will result in receiving negative and harsh judgements, such as being labelled as attention-seeking (Fortune, Sinclair, & Hawton, 2008a; Klineberg, Kelly, Stansfeld, & Bhui, 2013). Unfortunately, there is support for these concerns. NSSI disclosures are often met with fear, frustration, and confusion by parents (Oldershaw, Richards, Simic, & Schmidt, 2008), school staff (Berger, Hasking & Reupert, 2014; Heather, Toste, Sornberger & Wagner, 2011; Saunders, Hawton, Fortune & Farrell, 2012), and medical professionals (McAllister, Creedy, Moye & Farrugia, 2002). Such reactions may significantly impede the willingness for those engaging in NSSI to seek help. This is problematic as individuals who engage in self-injury report that disclosing their NSSI is the first step toward NSSI prevention and intervention (Fortunate, Sinclair, & Hawton, 2008b). Furthermore, failure to disclose one's NSSI has negative consequences beyond not receiving treatment. Lack of NSSI disclosure to friends and family can strain interpersonal relationships (Frable, Platt, Hooey, 1998; Pachankis, 2007) and increase

levels of personal distress (Finkenauer & Rimé, 1998; Pennebaker, Kiecolt-Glaser & Glaser, 1988; Pachankis, 2007), both of which are common NSSI precipitants (Nock, Prinstein, & Sterba, 2008).

Despite the importance of disclosing NSSI, limited research has examined factors that discriminate which individuals do versus do not disclose their behaviors, with the majority of these studies focusing on NSSI characteristics. Individuals with more severe NSSI behavior (e.g., greater number of acts, greater number of methods) are more likely to disclose their NSSI and access services (Armiento et al., 2014; Hasking et al., 2015; Heath, Baxter, Toste, & McLouth, 2010). Additionally, individuals reporting greater interpersonal motivations for NSSI engagement (e.g., to seek care or help from others) are more likely to disclose their behavior (Armiento et al., 2014), potentially because they may already be attempting to communicate their distress to others through NSSI engagement. Less is known, however, about factors that influence NSSI disclosure beyond the behavior itself.

Given the limited studies to date on NSSI disclosure, examining related literature on the disclosure of other emotional or stigmatizing experiences may be informative. For example, consistent with studies linking NSSI severity to disclosure, markers of psychological distress, such as psychopathology symptomology (Horesh & Apter, 2006) and poor self-image (Derlega, Winstead, Greene, Serovich, & Elwood, 2004; Gaucher, Wood, Stinson, Forest, Holmes, & Logel, 2012), are associated with disclosure of psychological difficulties and adverse events (e.g., risky behaviors, sexual assault). This suggests that individuals engaging in NSSI who experience higher levels of emotional distress (e.g.. negative rumination, depression, suicidality, heightened stress) and/or have

lower ability to tolerate distress may be more motivated to disclose their NSSI and seek help. However, other than two studies demonstrating an inconsistent association between NSSI disclosure and suicidal ideation (Armiento et al., 2014; Hasking et al., 2015), the relationships between NSSI disclosure and other emotional distress vulnerabilities have not been explored.

Interpersonal factors may also impact one's willingness to disclose their NSSI. Individuals engaging in self-injury report concerns that their NSSI disclosure will result in a lack of understanding, stigmatization, and increased interpersonal problems, particularly with parents and school staff (Fortune et al., 2008a; Klineberg et al., 2013). Thus, heightened internalization of NSSI-related stigma may serve as barrier to NSSI disclosure. It has also been demonstrated that individuals who perceive a lack of social support identify fewer opportunities for disclosure and, consequently, are less likely to disclose (Pennebaker & Francis, 1996). In line with this finding, NSSI disclosures are associated with greater perceived friendship quality (Armiento et al., 2015). Taken together, research to date suggests that both emotional distress vulnerabilities and interpersonal obstacles are central for understanding who discloses their NSSI.

Among those who disclose their NSSI, it is also important to consider one's choice in disclosure recipient, a decision that may impact access to care (Wu, Whitely, Stewart, & Liu, 2012). Research examining emotional and/or traumatic events has found individuals more often disclose to a close friend or peer than a family member or healthcare provider (Defense Manpower Data Center, 2016; Orchowski & Gidycz, 2012; Rimé et al., 1992). Likewise, individuals with NSSI also prefer to confide in peers (vs. others) about their NSSI (Evans et al., 2005; Heath, Toste & Beettam, 2006; Wu et al.,

2012). In fact, of who disclosed their NSSI, 70% reported telling a peer, whereas only 26% told a parent and a mere 13% told a mental health worker (Hasking et al., 2015).

Aside from potential fear of NSSI-related stigma (particularly from adults; Berger et al., 2017; Klineberg et al., 2013), little is known about factors associated with disclosure recipient choice. For example, in disclosing NSSI to a healthcare provider, it is unclear if the disclosure was prompted by the provider in response to the consequences of NSSI (i.e., noticing NSSI wounds or scarring) or by the individual engaging in NSSI seeking help from the provider. This is an important distinction as disclosures prompted by others (i.e., involuntary) have been shown to increase reluctance to enter professional help relationships (Fehler-Cabral & Campbell, 2013). Further, the experience of voluntary versus involuntary disclosures may be especially relevant to NSSI. For example, given that individuals with more severe NSSI are more likely to have physical indicators of their NSSI (e.g., scars; Burke, Hamilton, Cohen Stange, & Alloy, 2016) and require medical treatment for their NSSI (e.g., wound care), they may be more likely to be confronted about their NSSI behavior, especially by healthcare providers, increasing the likelihood of experiencing an involuntary disclosure. Overall, the choice of disclosure recipient may play an important role in the outcome of a NSSI disclosure; however, it may not solely be who the recipient is that has significance, but rather how their reaction to the NSSI disclosure is perceived that may be critical.

NSSI Disclosure Reactions

Upon disclosing an emotional event and/or behavior (e.g., NSSI), receiving a reaction that is perceived as negative or unhelpful has been related to increased psychological distress (e.g., Ullman 1996) and may even serve as a hindrance to

treatment engagement (Muehlenkamp et al., 2012), highlighting the need to better understand the experience of disclosing NSSI. For example, research examining the disclosure of other emotional events (e.g., sexual assault / abuse, medical diagnoses) has found that perceived negative social reactions were associated with increased maladaptive coping, disordered eating symptoms, and post-traumatic stress symptoms (Ullman, 1996; Ullman & Peter-Hagene, 2014; Waller & Ruddock, 1993), whereas perceived positive social reactions were associated with fewer post-traumatic stress symptoms (Ullman & Peter-Hagene, 2014), more adaptive coping (Ullman & Peter-Hagene, 2014), and increased quality of life (Chandra et al., 2003). Research on NSSI disclosure reactions has been more limited as there currently exists no validated assessment of perceived reactions to NSSI disclosure. In contrast, a measure of perceived social reactions of sexual assault disclosure (Social Reactions Questionnaire [SRQ]; Ullman, 1996; Ullman, 2000) has been essential in identifying and disentangling the impact of both positive social reactions (i.e., emotional support/belief, tangible aid/information) and negative social reactions (i.e., treated differently, distraction, others' taking control, being blamed, and egocentric responses) to sexual assault disclosure (Ullman, 1996; Ullman & Peter-Hagene, 2014). Many of the positive and negative reactions perceived during sexual assault disclosure are likely to also occur in response to disclosure of NSSI. However, there may also be reactions to NSSI disclosures that are not included in the SRQ, such as those unique to NSSI stigma (e.g., "attention seeking"; Fortune et al., 2008a; Klineberg et al., 2013), supporting the need for a scale specific to NSSI disclosure.

6

As with other emotional events (e.g., Ullman, 1996), not all NSSI disclosures will be met with positive reactions (Klineberg et al., 2013). The limited research on NSSI disclosure suggests reactions from others that are perceived as negative/unhelpful may reduce future disclosures (Muehlenkamp, Brausch, Quigley, & Whitlock, 2012; Toste & Heath, 2010) and hamper treatment engagement (Muehlenkamp et al., 2012). Reactions perceived as positive would likely have the opposite effect, though this has not been tested directly. NSSI disclosure experiences, and their impact, may tend to differ as a function of NSSI disclosure recipient. For example, medical staff describe negative attitudes toward working with those who engage in NSSI, including feelings of frustration, anger, and helplessness (Saunders, Hawton, Fortune, & Farrell, 2012), which may increase the likelihood of their reactions following disclosure being perceived as negative. In contrast, peers may be more understanding of the reasons one engages in NSSI (Breger et al., 2017; Bresin, Sand & Gordon, 2013), and, as such, their reactions may be perceived more positively. This has yet to be directly studied, but would be consistent with research on sexual assault disclosure (Ullman, 1996). Furthermore, reactions to a NSSI disclosure may differ as a function of how the disclosure was made, with individuals reporting an involuntary NSSI disclosure (i.e., not initiated by the individual engaging in self-injury) perceiving the reaction as more negative and being less sympathetic (Klineberg et al., 2013). Better understanding the experience of NSSI disclosures, including recipient choice and perceived reactions upon disclosure, will help to elucidate strategies to promote future disclosures and subsequent intervention.

Current Studies

To our knowledge, there has been no comprehensive study of the NSSI disclosure experience. The current study aimed to address this gap in the literature through two related studies. The first study aimed to identify factors associated with NSSI disclosure and characterize NSSI disclosure recipient choice among those who do disclose. The second study aimed to validate a self-report measure of perceived positive and negative reactions to one's NSSI disclosure (Self-Injury Social Reactions Questionnaire; SI-SRQ), as well as provide preliminary data on factors associated with perceived positive and negative NSSI disclosure reactions. The results of the current project have the potential to further the knowledge of NSSI disclosure, informing both intervention and prevention efforts, as well as ways of responding to NSSI disclosures more effectively.

Study 1

Study Overview

The first study identified factors that discriminated between individuals who do and do not disclose their NSSI, and characterized NSSI disclosure recipient choice. It was hypothesized that individuals who have disclosed their NSSI will report (1) more severe NSSI behavior and greater interpersonal motivations for NSSI; (2) greater emotional distress vulnerabilities (e.g., lower distress tolerance, greater rumination, greater perceived stress, greater depressive symptoms, presence of suicidal thoughts and behavior); and (3) fewer interpersonal obstacles (e.g., greater social support, lower stigma internalization). It was also hypothesized that NSSI disclosures to peers would be more prevalent than disclosures to family members, and, that disclosures to family members would be more prevalent than disclosures to healthcare providers. Finally, it was

expected that those who disclosed to a healthcare provider (vs. peer/family) would report greater NSSI severity and greater likelihood of having experienced an involuntary disclosure.

Method

Participants and procedures. Participants included 452 undergraduate students (81.90% female) recruited as part of a larger study at a large urban university. To be included in the current analyses participants had to report a history (e.g. at least one lifetime act) of NSSI. Participants ranged from ages 18 to 29 ($M = 20.00$, $SD = 2.80$) and identified as Caucasian (66.80%), Asian (11.50%), African-American (8.40%), multi-racial or other race (11.10%), or preferred not to answer (2.20%); participants predominantly identified as non-Hispanic or Latino (85.40%). Participants completed all study questionnaires online as part of a larger study and were offered course research credit for their participation. This study received approval from the institutional review board (IRB).

Measures.

Demographics. Participants were asked basic background information (e.g., age, sex, mental health history), in addition to family history of psychological problems and exposure to suicidal behavior (i.e., "Do you know anyone who has attempted suicide?").

Non-suicidal self-injury. The Inventory of Statements about Self-Injury (ISAS; Klonsky & Glenn, 2009) includes 26 items assessing 13 functions of NSSI, each of which is rated on a scale, where 0 = *not relevant*, 1 = *somewhat relevant,* and 2 = *very relevant*. Scores are averaged across items for each of the 13 functions, as well as for two overarching factors, interpersonal (social; e.g., "…seeking care or help from others") and

intrapersonal (internal; e.g., "…releasing emotional pressure that has built up inside of me") factors. Additional items also assess various NSSI characteristics (e.g., age of onset, physical pain). The measure has demonstrated good reliability (Klonsky & Glenn, 2009), validity (Klonsky & Olino, 2008), and test-retest reliability (Glenn & Klonsky, 2011) in undergraduate samples. The current study defined lifetime NSSI frequency as the total number (frequency) of NSSI acts across the lifetime and number of NSSI methods as the total number of different NSSI methods used across the lifetime. The function subscales demonstrated good internal reliability in the current sample: interpersonal subscale, α = .89; intrapersonal subscale, α = .90.

Non-suicidal self-injury disclosure characteristics. The Characteristics of Self-Injury Disclosure is a brief self-report measure about disclosure of NSSI that was developed for the current studies. Individual items were adapted from previous literature on NSSI disclosure (e.g., Armiento et al., 2014, Hasking et al., 2015, Muehlenkamp et al. 2012) in order to ask participants details about the initial disclosure of their NSSI, including the timing of their disclosure, circumstances of disclosure (e.g., if it was by choice [voluntary]), and the recipient of their disclosure. These items have been previously used in adolescent community samples (e.g.. Armiento et al., 2014; Hasking et al., 2015). Individuals were classified as disclosing to a peer if they reported disclosing to a peer or significant other; individuals were classified as disclosing to a family member if they reported disclosing to a relative; individuals were classified as disclosing to a healthcare provider if they reported disclosing to a medical or mental health provider.

Distress tolerance. The Distress Tolerance Scale (DTS; Simons & Gaher, 2005) is a self-report measure composed of 15 items that assess one's ability to tolerate

emotional distress (e.g., "My feelings of distress are so intense that they completely take over"). Items are rated on a 5-point Likert scale (1 = *Strongly Agree* to 5 = *Strongly Disagree*), where greater scores represent greater ability to tolerate distress. This measure has shown good internal consistency, as well as convergent and divergent validity, and adequate test-rest reliability (Simons & Gaher, 2005) in undergraduate samples. The scale demonstrated excellent reliability in the current sample, $\alpha = .98$.

Ruminative thinking. The Ruminative Response Scale (RRS; Treynor, Gonzalez, & Nolen-Hoeksema, 2003) is a 10-item measure that assesses ruminative responses to sad/depressed mood (e.g., "Think about how you don't feel up to doing anything"). Items are rated on a 4-point Likert scale (1 = *Almost Never* to 4 = *Almost Always*). This measure has shown good reliability and validity and adequate test-rest reliability (Treynor, Gonzalez, & Nolen-Hoeksema, 2003) in undergraduate samples. The subscales demonstrated excellent reliability in the current sample, depression-related rumination subscale, $\alpha = .97$; brooding-related rumination subscale, $\alpha = .93$; and reflection-related rumination subscale, $\alpha = .91$.

Perceived stress. The Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983) is a 14-item self-report measure that assesses perceived stress over the previous month (e.g., "Felt difficulties were piling up so high that you could not overcome them"). Responses are provided on a 5-point Likert scale (0 = *Never* to 4 = *Very Often*). This measure has demonstrated good reliability and validity (Cohen et al., 1983) in undergraduate samples. The scale demonstrated good reliability in the current sample, $\alpha = .75$.

Depressive symptoms. The Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996) is a 21-item self-report inventory assessing depressive symptomology over the previous week. Each item consists of four alternative statements that represent gradations of a given symptom, rated in severity from 0 to 3. The BDI-II demonstrates strong psychometric properties, including reliability, validity, and test-retest reliability (Beck et al., 1996) in a wide variety of samples. The scale demonstrated excellent reliability in the current sample, $\alpha = .95$.

Suicidal thoughts and behavior. The Suicidal Behaviors Questionnaire – Revised (SBQ-R; Osman et al., 2001) is a four-item, forced-choice, self-report measure, designed to assess four dimensions of suicidality (lifetime ideation/attempt, frequency of ideation during past year, threat of suicidal behavior, and likelihood of future suicidal behavior). This measure demonstrates strong psychometric properties (reliability and validity) and has been supported for use with both psychiatric and community samples (Osman et al., 2001). Only one item was used in the current study, which was re-coded (0 = *not present*, 1 = *present*) for the presence of lifetime suicidal ideation, lifetime suicide plan, and lifetime suicide attempt.

Perceived social support. The Multidimensional Scale of Perceived Social Support (MSPSS; Zimet, Dahlem, Zimet, & Farley, 1988) is a 12-item self-report measure that assesses perceived social support from one's family, friends, and significant other (e.g., "I get the emotional help and support I need from family"). Responses are provided on a 7-point Likert scale (1 = *Very Strongly Disagree* to 7 = *Very Strongly Agree*). The MSPSS has demonstrated good reliability, validity, and test-retest reliability

(Zimet et al., 1988) in an undergraduate sample. The scale demonstrated excellent reliability in the current sample, $\alpha = .97$.

Mental health stigma internalization. The Internalized Stigma of Mental Illness Inventory -10-item version (ISMI-10; Boyd, Otilingam, Zimet, & Farley, 2013; Ritscher et al., 2003) is a 10-item self-report measure that assesses individual's internalization of stigma toward mental illness (e.g., "People ignore me or take me less seriously just because I have a mental illness"). Responses are provided on a 4-point Likert scale (1 = *Strongly Disagree* to 4 = *Strongly Agree*). The psychometrics (e.g., reliability, validity, test-re-test reliability) of this measure have been supported (Boyd et al., 2013) in a variety of psychiatric and community samples. The scale demonstrated good reliability in the current sample, $\alpha = .86$.

Data analytic plan. All variables were examined for skew statistics and outliers. An analysis of skew indicated that variables were not significantly skewed (skew statistics = -1.02 to .56), with the exception of lifetime NSSI acts (skew statistic = 17.06). Examining the boxplot, two cases were identified as extreme outliers and were removed from analyses, resulting in skew = 16.43. Given this, three variables were windsorized to one value higher than three standard deviations above the mean (value = 4962). A series of univariate *t*-tests and chi-squared analyses were conducted to investigate the relationship between demographic variables and dependent (disclosure, disclosure recipient, nature of disclosure) variables. Pearson's correlations were used to examine relationships among the independent variables. For all analyses examining gender, participants identifying as transgender (*N*=4) were removed from analyses due to small sample size. A critical alpha of .05 was used for all preliminary analyses. To address the

primary aims of Study 1, a series of *t*-tests and chi-square tests were used to examine

potential group differences between those who have and have not disclosed their NSSI on

NSSI characteristics, emotional distress vulnerabilities, and interpersonal obstacles.

Among those who have disclosed their NSSI, *t*-tests and chi-squares were used to

examine NSSI disclosure recipient choice and potential group differences on NSSI

severity and nature of NSSI disclosure based on recipient choice. Given the number of

analyses conducted, a critical value of .01 was applied to all primary analyses.

Results

    Preliminary analyses. All variables were related in the expected direction(s). The

majority of variables were significantly ($p < .05$) correlated ($r's = .10$ to .80), with the

exception of NSSI frequency and interpersonal functions. NSSI frequency was not

significantly correlated with NSSI interpersonal functions, reflection subscale of

rumination, perceived stress, suicidal ideation, suicide attempts, and social support; a

similar pattern of correlations was found for NSSI interpersonal functions. See Table 1

for full correlation matrix of study variables.

Table 1

Correlations between all primary study variables in Study 1

	M (SD)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
NSSI Frequency	258.16 (595.11)															
NSSI Methods	3.64 (2.26)	.29**														
Interpersonal	5.44 (6.16)	.04	.19**													
Intrapersonal	12.18 (7.31)	.13**	.34**	.43**												
Distress Tolerance	43.34 (12.67)	-.14**	-.17**	-.07	-.19**											
Brooding	12.18 (3.70)	.20**	.23**	.12*	.35**	-.51**										
Reflection	11.80 (3.52)	.09	.21**	.10	.30**	-.32**	.61**									
Depressive	29.39 (8.54)	.15**	.28**	.12*	.40**	-.53**	.80**	.62**								
Perceived Stress	31.02 (6.23)	.08	.17**	.03	.27**	-.41**	.50**	.31**	.59**							
Depression	19.89 (12.63)	.19**	.30**	.12*	.37**	-.43**	.49**	.30**	.64**	.62**						
Suicidal Ideation[+]	82.00	.08	.21**	.12*	.29**	-.13*	.18**	.09	.21**	.14**	.19**					
Suicide Plan[+]	47.10	.18**	.30**	.10*	.40**	-.11*	.18**	.16**	.24**	.16**	.27**	.44**				
Suicide Attempt[+]	15.63	.03	.23**	.01	.24**	-.12*	.15**	.09	.17**	.12**	.20**	.20**	.46**			
Social Support	5.18 (1.38)	.01	-.11*	-.11*	-.09	.11*	-.15**	-.07	-.18**	-.15	-.29**	-.14**	-.11*	-.15**		
Stigma	1.88 (.42)	.10*	.23**	.23*	.23**	-.33**	.44**	.24**	.38**	.38**	.49**	.05	.17**	.17**	-.30**	
Total *N*		450	450	408	427	418	414	414	414	447	446	450	448	448	447	448

Note: [+] percent endorsement; * = $p <.05$; ** = $p <.01$; NSSI frequency, methods, interpersonal, and intrapersonal = Inventory of Statements about Self-Injury; distress tolerance = Distress Tolerance Scale; Brooding, reflection, depression = Ruminative Response Scale; perceived stress = Perceived Stress Scale; depression = Beck Depression Inventory -II; suicidal ideation, suicide plan, suicide attempt = Suicide Behavior Questionnaire – Revised; social support = Multidimensional Scale of Perceived Social Support; stigma = Internalized Stigma of Mental Illness Inventory

The mean number of lifetime NSSI acts in the overall sample was 258.16 (SD = 595.11, median = 56.50, range = 1-4962); the mean number of lifetime NSSI methods was 3.64 (SD = 2.26, median = 3, range = 1-12). The majority of participants last engaged in NSSI one or more years ago (n = 252, 57.40%), followed by 10.30% (n = 45) reporting their last NSSI act was six months to one year ago, 8.40% (n = 37) reporting less than one wee/k ago, 8.40% (n = 37) reporting three to six months ago, 8.20% (n = 36) reporting one to three months ago, and 7.30% (n = 32) reporting one week to one month ago.

Two-hundred seventy-one (60.00%) participants had disclosed their NSSI behavior at least once. There were no age difference between those who had (M = 20.50, SD = 3.09) and had not (M = 20.13, SD = 2.29) disclosed their NSSI, t (444) = -1.38, p =.17, d = .14. Likelihood of disclosing did not vary by race (disclosed NSSI = 72.00% Caucasian, 7.10% African American, 10.10% Asian, 10.80% Multiracial/Other; did not disclose NSSI = 61.50% Caucasian, 12.30% African American, 14.00% Asian, 12.30% Multiracial/Other; χ^2 [3] = 6.76, p = .08, v = .13). However, there were gender differences, with females (62.00%) being more likely than males (47.30%) to disclose their NSSI, χ^2 (1) =5.49, p = .02, v = .11.

Of those who had disclosed their behavior, 187 (69.50%) reported having disclosed to a peer, 83 (30.90%) reported having disclosed to a family member, and 65 (24.20%) reported having disclosed to a healthcare provider. Furthermore, 39 (14.50%) of those who disclosed reported their disclosure was involuntary.

Primary analyses. See Table 2 for means, standard deviations, and group differences for below analyses.[1]

Table 2

Means, standard deviations, and group differences on primary study variables between NSSI disclosure groups in Study 1

	NSSI Disclosure (*n* = 269) *M* (SD)	No NSSI Disclosure (*n* = 181) *M* (SD)	*t* / χ^2 statistics	Cohen's *d/* Cramer's ν
NSSI Characteristics				
Total NSSI Acts	282.27 (697.52)	222.34 (396.04)	-1.05	.11
Total NSSI Methods	3.65 (2.32)	3.63 (2.18)	-.11	.01
NSSI Interpersonal Functions	6.11 (6.23)	4.46 (5.95)	-2.66*	.27
NSSI Intrapersonal Functions	13.87 (7.02)	9.69 (7.03)	-6.03**	.60
Emotional Distress Vulnerabilities				
Distress Tolerance	43.07 (12.99)	43.80 (12.13)	.57	.06
Rumination - Brooding	12.23 (3.70)	12.10 (3.71)	-.36	.04
Rumination – Reflection	11.80 (3.50)	11.81 (3.59)	.01	.002
Rumination - Depression	29.59 (8.64)	29.05 (8.39)	-.62	.0
Perceived Stress	30.88 (6.41)	31.24 (5.96)	.58	.06
Depressive Symptoms	20.03 (12.89)	19.65 (12.22)	-.29	.03
Suicidal Ideation[+]	85.10%	77.30%	4.44[#]	.10
Suicide Plan[+]	55.00%	35.20%	16.95**	.20
Suicide Attempt[+]	21.20%	7.30%	15.81**	.19
Interpersonal Obstacles				
Social Support	5.22 (1.35)	5.12 (1.43)	-.74	.07
Significant Other	5.66 (1.55)	5.20 (1.67)	-2.97*	.29
Friend	5.12 (1.35)	5.07 (1.43)	-.40	.04
Family	4.87 (1.69)	5.10 (1.71)	1.33	.14
Stigma Internalization	1.88 (.43)	1.87 (.41)	-.03	.02

Note: [+] percent endorsement; [a] = percentages per racial group are in-text; ** $p \leq .001$; * $p \leq .01$; [#] $p <.05$; NSSI characteristics = Inventory of Statements about Self-Injury; distress tolerance = Distress Tolerance Scale; rumination – brooding, reflection, depression = Ruminative Response Scale; perceived stress = Perceived Stress Scale; depressive symptoms = Beck Depression Inventory -II; suicidal ideation, suicide plan, suicide attempt = Suicide Behavior Questionnaire – Revised; social support = Multidimensional Scale of Perceived Social Support; stigma internalization = Internalized Stigma of Mental Illness Inventory

NSSI characteristics. Those who disclosed their NSSI endorsed significantly higher levels of interpersonal and intrapersonal functions of NSSI. There were no differences between those who did and did not disclose their NSSI on number of lifetime acts[2] or number of lifetime methods.

Emotional distress vulnerabilities. Those who disclosed their NSSI were more likely to report having a suicide plan and having attempted suicide than individuals who had not disclosed. Group differences on likelihood of reporting suicidal ideation were trending ($p = .035$). There were no differences between those who did and did not disclose their NSSI on distress tolerance, rumination – brooding type, rumination – reflection type, rumination – depression type, perceived stress, or depressive symptomology.

Interpersonal obstacles. Individuals who disclosed their NSSI reported greater perceived support from significant others. There were no differences between those who did and did not disclose their NSSI on overall perceived social support, perceived support from friends, perceived support from family, and stigma internalization.

Characterizing NSSI recipient choice. Individuals who disclosed their NSSI were more likely to disclose to a peer compared to family member, $\chi^2 (1) = 42.37$, $p <.001$, $v = .40$; there was not a significant difference in the presence of a family member versus healthcare provider disclosure, $\chi^2 (1) = .09$, $p = .77$, $v = .02$.

There were no differences on number of lifetime NSSI acts between those who disclosed to a healthcare provider ($M = 232.57$, $SD = 643.87$) versus having disclosed to a peer or family member ($M = 298.11$, $SD = 714.55$), $t (267) = .66$, $p = .51$, $d = .10^2$. Similarly, there were no differences on lifetime NSSI methods between those disclosed to

a healthcare provider ($M = 3.93$, $SD = 2.43$) versus a peer or family member ($M = 3.57$,

$SD = 2.28$), t (267) = -1.07, $p = .28$, $d = .15$. Those who disclosed to a healthcare provider

(21.50%) were not more likely to report that their disclosure was involuntary compared to

those who disclosed to peer or family member (12.30%), χ^2 (1) = 3.43, $p = .06$, $v = .11$.[3]

Exploratory analyses.

Factors discriminating those who did and did not disclose their NSSI. Given

that there were no differences between those who did and did not disclose their NSSI on

stigma internalization, additional social / contextual factors (i.e., familial history of

mental health difficulties, suicide attempt exposure) that may impact disclosure

likelihood were explored. Individuals who disclosed their NSSI (86.40%) were more

likely to report an immediate family member having experienced a psychological

problem than those who did not disclose their NSSI (73.00%), χ^2 (1) = 9.77, $p = .002$, $v =$

.17. Similarly, those who disclosed their NSSI (82.60%) were significantly more likely to

report knowing someone who had attempted suicide than those who did not disclose their

NSSI (68.20%), χ^2 (1) = 10.45, $p = .005$, $v = .17$.

Considering that traditional measures of NSSI severity were not associated with

disclosure, additional analyses explored other NSSI characteristics (i.e., primary method

of NSSI, experience of physical pain) that may be important to consider in the likelihood

of disclosing one's NSSI. Individuals who disclosed their NSSI (50.20%) were more

likely to identify their main form of NSSI as self-cutting (as opposed to any other form of

NSSI) than those who did not disclose (21.20%), χ^2 (1) = 36.43, $p < .001$, $v = .29$. Those

who disclosed their NSSI ($M = 1.44$, $SD = .64$) also reported feeling physical pain more

often during self-injury compared to those who did not disclose their NSSI (M = 1.22, SD = .69), t (422) = -3.48, p = .001, d = .33.

     Factors associated with NSSI disclosure recipient choice. As we found demographic differences (i.e., gender) on likelihood to disclose NSSI, exploratory analyses examined potential demographic differences as a function of disclosure recipient choice and the nature of their disclosure. There were no differences between those who had and had not disclosed to a peer on age, t (266) = 1.71, p = .09, d = .20; race, χ^2 (3) = 7.83, p = .05, v = .17; or gender, χ^2 (1) = .87, p = .35, v = .05. There were no differences between those who had and had not disclosed to a family member on age, t (266) = -1.29, p = .20, d = .16; race, χ^2 (3) = 5.01, p = .17, v = .14; or gender, χ^2 (1) = .86, p = .35, v = .06. Those who disclosed to a healthcare provider were older than those who had not [2], t (266) = -3.20, p = .002, d = .36. There were no differences between those who had and had not disclosed to a healthcare provider on race, χ^2 (3) = 2.45, p = .49, v = .10; or gender, χ^2 (1) = .39, p = .53, v = .04. There were no differences between those who reported their disclosure to be voluntary versus involuntary on age, t (266) = -.82, p = .41, d = .17; race, χ^2 (3) = 1.38, p = .71, v = .07; or gender, χ^2 (1) = 1.25, p = .26, v = .07. See Table 3 for demographic characteristics as a function of disclosure characteristics.

Table 3

Study 1 exploratory analyses examining demographic information as a function of disclosure characteristics

| | Age | Female | Race *n* (%) | | | |
| | | | African | Caucasian | Asian | Multiracial/ |
	M (SD)	*n* (%)	American			Other
Disclosure Recipient						
Peer	20.29 (2.25)	161 (70.60)	7 (41.20)	135 (71.10)	18 (66.70)	22 (78.60)
No Peer	20.99 (4.19)	67 (29.40)	10 (58.80)	55 (28.90)	9 (33.30)	6 (21.4)
Family	20.87 (3.92)	67 (29.40)	9 (52.90)	53 (27.90)	8 (29.60)	10 (35.70)
No Family	20.34 (2.64)	161 (70.60)	8 (47.10)	137 (72.10)	19 (70.40)	18 (64.30)
Provider	21.55 (5.00)	54 (23.70)	5 (29.40)	47 (24.70)	4 (14.80)	9 (32.10)
No Provider	20.17 (2.06)	174 (76.30)	12 (70.60)	143 (75.30)	23 (85.20)	19 (67.90)
Nature of Disclosure						
Involuntary	20.13 (2.34)	36 (92.30)	1 (5.90)	27 (14.20)	2 (18.50)	4 (14.30)
Voluntary	20.57 (3.20)	192 (84.20)	16 (94.10)	163 (85.80)	22 (81.50)	24 (85.70)

Note: All variables from Non-Suicidal Self-Injury Disclosure Characteristics measure

Discussion

Study 1 aimed to identify factors that discriminate between those who did and did not disclose their NSSI, and to better understand the choice of NSSI disclosure recipient among those who disclosed. First, it was hypothesized that individuals who disclosed their NSSI would report greater NSSI severity, increased emotional distress vulnerabilities, and fewer interpersonal obstacles than those who had not disclosed their NSSI. Among those who disclosed their NSSI, it was hypothesized that peer disclosures would be most common and that individuals reporting more severe NSSI and an involuntary disclosure would be more likely to have disclosed to a healthcare provider. Those who disclosed their NSSI reported greater NSSI motivations, in addition to greater likelihood of having had a suicide plan and suicide attempt. Additionally, among those who disclosed their NSSI, disclosures to peers were most common. Most other hypotheses were unsupported, however. No differences on NSSI characteristics, emotional distress vulnerabilities, or interpersonal obstacles between those who had and had not disclosed were found, nor was there was not a relationship between NSSI severity and nature of disclosure with disclosing to a healthcare provider.

Individuals who disclosed their NSSI reported greater endorsement of both the interpersonal and intrapersonal motivations for NSSI. This supports previous research on interpersonal motivations (Armiento et al, 2014), and also extends the finding to include those who identify NSSI as a key way to cope with negative emotions. Though it is unclear why disclosure was associated with intrapersonal NSSI motivations, one possibility is that in the current sample, which reported more frequent NSSI than the sample utilized by Armiento et al. (2014), intrapersonal motivation endorsement served

as a marker of NSSI severity. Previous research has demonstrated a relationship between greater endorsement of NSSI functions and severity of NSSI behavior (e.g., Lloyd-Richardson, Perrine, Dierker, & Kelly), an association also supported in the present study. Thus, at lower levels of NSSI frequency, the specific number of acts may indicate more problematic or distressing behaviors, increasing the likelihood of disclosure, whereas at higher levels of frequency, the number of NSSI acts may be less important (e.g., Paul, Tsyspes, Elditz, Ernhout & Whitlock, 2015), and instead greater endorsement of NSSI functions may serve as a marker of distress/severity.

Contrary to previous research (Hasking et al., 2015), individuals who disclosed their NSSI did not report more frequent NSSI or a greater number of NSSI methods. It is possible that the present study found differing results from existing literature given the severity of NSSI present in the sample. For example, the sample included in the Hasking and colleagues' research had an average lifetime NSSI frequency of approximately 17 acts (Hasking et al., 2015), whereas participants in the current sample, on average, reported over 250 lifetime acts of NSSI (median = 56.50). Thus, there may be differences in disclosure patterns between those who report low to moderate NSSI engagement throughout their lifetime, but not among individuals who predominantly report high levels of NSSI throughout their lifetime. Previous research has demonstrated a curvilinear relationship between NSSI frequency and suicidality (e.g. Paul et al., 2015), where the relationship becomes nonsignignifcant at greater (50+ acts) NSSI frequencies. It is possible that a similar relationship exists between NSSI frequency and disclosure. For example, for individuals who engage in NSSI at higher frequency, the behavior tends to become habitual or more a part of their identity (Glenn, Kleiman, Cha, Nock, &

Prinstein, 2016). Consequently, there may be less acute concern or distress, reducing the likelihood of their disclosing this behavior.

Considering findings related to emotional distress vulnerabilities, individuals who disclosed their NSSI were more likely to report having had a suicide plan and suicide attempt during their lifetime; in contrast, there were no differences between those who did and did not disclose their NSSI on other emotional distress vulnerabilities, such as depression symptomology, rumination, or stress levels. Given previous research highlighting the role of psychological distress (i.e., depression, anxiety) in disclosure among individuals experiencing suicidal thoughts / behaviors (Horesh & Apter, 2006), it was anticipated that a similar relationship would exist with NSSI disclosure. Instead, it may be that elevated distress specific to self-injury (including suicidal plans / attempts), as opposed to general psychological distress, is driving NSSI disclosures. This is in part supported by our finding that disclosures were associated with greater endorsement of NSSI intrapersonal motivations. An alternative, though not mutually exclusive, explanation for the relationship between disclosure and suicidality is that individuals who have had a suicide plan or attempted suicide may also be more likely to have required medical or psychiatric attention due to their self-injurious behavior, prompting discussions in close relationships about current difficulties.

Among interpersonal factors, those who disclosed their NSSI reported more social support from a significant other. Otherwise, those who had and had not disclosed their NSSI reported comparable levels of overall social support and support from peers or family members. The finding that significant other (but not friend or family) support discriminated between those who disclosed their NSSI is in contrast to previous research

demonstrating an association between friendship quality and NSSI disclosure (Armiento et al, 2014). However, Armiento et al. (2014) did not differentiate between romantic and peer relationships, limiting the specificity of their conclusions. The influence of romantic partner support in NSSI disclosure is in line with, and also extends, findings highlighting the importance of romantic relationships in the occurrence of self-injury. While previous research has demonstrated that certain aspects of romantanic relationships, such as insecure attachment and fear of abandonment, may be predictive of NSSI behaviors (e.g., Levesque, Lafontaine, & Bureau, 2017; Levesque, Lafontain, Bureau, Cloutier, & Dandurand, 2010), the current findings demonstrate the having a supportive romantic relationship may promote disclosure of the behavior.

The current findings also demonstrated nonsignificant findings between those who did and did not disclose their NSSI on internalization of mental health stigma. Since studies that highlighted the concern of stigma as a barrier to disclosure (Fortune et al., 2008a; Klineberg et al., 2013), it is possible that attitudes toward NSSI have improved. In recent years, NSSI has been portrayed in media more frequently and there have even been wider efforts to de-stigmatize the behavior (i.e., Self-Injury Awareness Day). The current findings may also be limited by the use of a measure of general mental health (vs. NSSI) stigma internalization, as no NSSI-specific stigma measure currently exists. It also important to consider that the current sample had self-selected to participate in a study adverstised as a study about harm and social relationships, and severity of NSSI in the current sample was high (which may have "normalized" this behavior to the individual). These factors may be indicative of a lower overall concerns about stigma related to harmful behaviors. Future research should continue to explore the impact of NSSI-

specific stigma and if attitudes or stigma toward NSSI have indeed changed over time. If this is found to be true, and concerns about NSSI stigma no longer serve as a barrier for disclosure, this may provide support for media campaigns promoting awareness and dispelling myths about NSSI.

Given limited group differences on study variables between those who did and did not disclose their NSSI, it raises the question of what factors do contribute to an individual disclosing his or her behavior? Exploratory analyses aimed to assess at least one possibility: an individual's exposure to psychological difficulties. Findings revealed that those who disclosed their NSSI were more likely to report that immediate family members had a psychological problem and were more likely to know someone who attempted suicide. Being aware of the psychological difficulties that someone else is experiencing, or has experienced, may increase one's perception of how open others are to discuss these topics, thus promoting NSSI disclosure (Klineberg et al., 2013). Moreover, the individual engaging in NSSI may observe others talking about or receiving treatment for their issues, which may provide a positive model of help-seeking behavior.

Supporting hypotheses, and consistent with previous research on disclosures of NSSI (Evans et al, 2005; Hasking et al., 2015; Heath et al., 2006) and other emotional events (Orchowski & Gidycz, 2012; Rimé et al., 1992), peers were the most common disclosure recipients, with nearly 70% of disclosures being to peers. In contrast, there were no differences in rates of disclosure between family members and healthcare providers. When considering previous research, rates of disclosure to providers found in the (overall) current sample are comparable. For example, earlier reports of 13% disclosing to a mental health provider (Hasking et al., 2015) are similar to approximately

14% of individuals who engaged in NSSI in the current sample disclosing to a healthcare provider. While surprising that family members were not more likely to be recipients of NSSI disclosures, this could be due to concerns about adult's reactions upon disclosing NSSI (Berger et al., 2017; Klineberg et al., 2013). This finding may also suggest that those engaging in NSSI are aware of negative attitudes towards NSSI held by parents and medical providers (e.g., Oldershaw, Richards, Simic, & Schmidt, 2008; Saunders, Hawton, Fortune, & Farrell, 2012), which could translate into reluctance to disclose their behavior. However, this is admittedly speculative and needs to be further studied.

Finally, contrary to our hypotheses, individuals who disclosed to a healthcare provider did not report engaging in a greater number of NSSI acts or methods, nor did they report a greater proportion of involuntary disclosures. Comparable NSSI severity between those who did and did not disclose to a healthcare provider could account for the null findings related to voluntary versus involuntary disclosures. For example, it would be expected that individuals engaging in more severe NSSI would be more likely to receive medical treatment for their NSSI, or to have more scars from their behavior (Burke et al., 2015), translating into a greater potential of a disclosure initiated by a healthcare provider; however, if those disclosing to a healthcare provider do not report more severe behavior, this relationship may be mitigated. Even though individuals in the current sample who reported an involuntary disclosure did report utilizing a greater number of NSSI methods, they did not engage in NSSI at a greater frequency, suggesting NSSI severity may not have been the driving factor. Instead, differences in reports of involuntary disclosures among those who disclosed to a healthcare provider may be accounted for by treatment seeking behavior. Indeed, approximately 97% of individuals

who reported disclosing their NSSI to a healthcare provider in the current sample also reported having received mental health treatment. While it is unclear if this treatment was targeting NSSI, research has demonstrated that approximately 50% of those who have engaged in NSSI are currently in mental health treatment (Deliberto & Nock, 2008). Given this, it could be that individuals who disclosed their NSSI to a healthcare provider did so in attempts to access treatment. This further highlights the role of healthcare providers in treatment engagement. Considering current findings that suggest individuals who disclose their NSSI may perceive psychological difficulties as an accessible conversation topic, it may be important for healthcare providers to create time for such discussions as a way to promote NSSI disclosure. However, future research will be necessary to better understand the choice of disclosing one's NSSI to a healthcare provider and how this decision relates to treatment motivation and subsequent engagement.

Study 2

Study Overview

The primary aims of this study were (1) to develop and validate a self-report measure (Self-Injury Social Reactions Questionnaire [SI-SRQ]) to assess both positive and negative social reactions to NSSI disclosures as experienced by the individual disclosing their behavior, and (2) provide preliminary knowledge about factors associated with positive and negative NSSI disclosure reactions. An initial version of the SI-SQR was assessed in an undergraduate sample to determine a final item set and factor structure. Then, findings were replicated using an external, community sample. Given the SI-SRQ was adapted from a measure assessing the social reactions following a sexual

assault disclosure (SRQ), it was expected that the SI-SRQ would maintain several of the same positive and negative subscales, in addition to a subscale related to NSSI-specific stigma. Convergent validity was assessed by correlating the SI-SRQ positive reaction subscale(s) with perceived social support and the negative reaction subscale(s) with stigma internalization. Discriminant validity was assessed by examining the association between SI-SRQ positive and negative reaction subscales(s) with measures not theoretically associated with NSSI disclosure reactions (e.g., distress tolerance). Further, it was hypothesized that individuals reporting more positive NSSI disclosure reactions would report a greater proportion of peer disclosures, in addition to a greater number of disclosures. On the other hand, those who reported more negative NSSI disclosure reactions were expected to report a greater proportion of involuntary disclosures and a fewer number of overall disclosures.

Method

Participants and procedures.

Undergraduate sample. Participants included 269 undergraduate students recruited from a large urban university who reported a history (e.g., at least one lifetime act) of NSSI and had disclosed their NSSI to at least one person. These participants were a subset of participants who participated in Study 1; see Study 1 participants and procedures section for study procedures. Participants ranged from ages 18 to 47 ($M = 20.50$, $SD = 3.09$), were 84.80% female, and identified as Caucasian (70.60%), Asian (10.00%), African-American (6.30%), multi-racial or another race (10.40%), or preferred not to answer (2.60%), and predominantly identified as non-Hispanic or Latino (84.40%).

Community sample. Participants were recruited via Amazon mechanical turk (mTurk). After removal of 17 duplicate cases, the sample was 217 participants that reported a history (e.g., at least one lifetime act) of NSSI and had disclosed their NSSI to at least one person. The current study was posted as a task that can be done at the participant's (worker's) computer via linking to an online survey tool. Inclusion criteria for mTurk participants were: 18 years of age or older, located in the United States, and had a 95% completion rate for other surveys on mTurk. Participants ranged from ages 19 to 63 ($M = 30.81$, $SD = 8.25$), were 74.07% female, and identified as Caucasian (74.60%), Asian (6.00%), African-American (11.10%), multi-racial or another race (6.90%), or preferred not to answer (0.05%), and predominantly identified as non-Hispanic or Latino (89.20%). Participants received monetary compensation for their participation. This study received IRB approval.

Measures

Demographics. See Study 1 measures.

Non-suicidal self-injury. See Study 1 measures.

Non-suicidal self-injury disclosure characteristics. See Study 1 measures.

Non-suicidal self-injury disclosure reactions. The Self-Injury Social Reactions Questionnaire (SI-SRQ) was developed for this study to assess the perceptions of the social reactions an individual receives upon disclosing their NSSI. This scale was adapted from the original SRQ (Ullman, 2000), which assesses the social reactions upon disclosure of sexual assault. In modifying this measure to assess NSSI disclosure reactions, the theoretical structure of the SRQ was considered: seven subscales characterizing positive ("tangible aid/information," "emotional support/belief"), and

negative ("victim blame," "egocentric", "distraction," "take control," "treat differently") reactions (Ullman, 2000).

To develop the items for the SI-SRQ, the following steps were taken. First, seven items that were specific to the experience of sexual assault were removed (e.g., "reframed the experience as a clear case of victimization," "took you to the police," "wanted to seek revenge on the perpetrator"). Next, nine items were modified to better reflect NSSI behaviors as opposed to the experience of sexual assault. The main change was revising the wording "your experience" to "your behavior." Finally, five items were added to the SI-SRQ that reflect reactions that are specific to NSSI disclosure. These items were developed through a review of the literature (e.g., Klineberg et al., 2013) and a focus group of researchers with expertise in self-injurious behaviors. The content of these items included misconceptions of NSSI (i.e., "told you that you are just trying to get attention," "told you that you are just trying to manipulate others," "told you that you were acting irresponsibly"); attempts to control the NSSI behavior (i.e., "made you promise to stop engaging in the behavior"); and emotional support surrounding NSSI (i.e., "believed you were trying your best"). This resulted in a total of 46 items. The instructions from the SRQ were modified to address disclosures of NSSI; however, we maintained the same 5-point Likert scale for responses, where 0 = *never*, 1 = *rarely,* 2 = *sometimes*, 3 = *frequently*, 4 = *always.* The SI-SRQ was tested in a small pilot study (i.e., review by several independent parties) prior to use in the study. In addition to the 46 items assessing potential reactions, participants were asked questions about which disclosure experience they were thinking about when answering the questions (i.e., first, most recent, most positive, most negative, a different disclosure), how helpful the disclosure reactions were,

31

if they continued hurting themselves following the disclosure, and if they would disclose the behavior again in the future. See Appendix A.

Perceived social support. See Study 1 measures. This scale demonstrated excellent reliability in the undergraduate, $\alpha = .94$, and community, $\alpha = .91$, samples.

Mental health stigma internalization. See Study 1 measures. This scale demonstrated adequate reliability in the undergraduate, $\alpha = .77$, and community, $\alpha = .82$, samples.

Distress tolerance. See Study 1 measures. The scale demonstrated excellent reliability in the undergraduate, $\alpha = .95$, and community, $\alpha = .96$, samples.

Data Analytic Plan

Within the undergraduate sample, an analysis of skew indicated the only variable of significant skew was lifetime NSSI acts (skew statistic = 17.06). Examining the boxplot, two cases were identified as extreme outliers and were removed from analyses, resulting in a skew statistic of 16.43. Given this, three values were windsorized to one value higher than three standard deviations above the mean (value = 4962). Within the community sample, lifetime NSSI acts were also significantly skewed (skew statistic = 14.73). Examining the boxplot, one case was identified as an extreme outlier and removed from analyses (resultant skewness statistic = 10.07). Four values were then windsorized to one value higher than three standard deviations above the mean (value = 25354). An analysis of skew indicated that all SI-SRQ items within the undergraduate and community samples met the normality assumption (skewness = -1.04 to 2.25). The range of each item (0-4) reflects the minimum and maximum values possible. Five cases

from the community sample were removed from all analyses due to having missing data on all SI-SRQ items, resulting in a final sample of 211.

Given the current study aimed to examine the initial factor structure of the SI-SRQ, an exploratory factor analysis (EFA) was first run utilizing the undergraduate sample (Worthington & Whittaker, 2006; Yong & Pearce, 2013). Maximum likelihood and oblique promax rotation were used (Floyd & Widaman, 1995). Multiple indices were evaluated to determine the appropriate number of factors: eigenvalues, scree plot, factor interpretability, and parallel analysis (principal axis factor with 99% confidence interval and 1,000 random generated data sets; O'Connor, 2000). Upon arriving at the best fitting factor solution, factor correlations and item loadings were examined. Items that demonstrated poor loadings (<.40) and/or had high cross loadings (>.40) were removed (Tabachnick & Fidell, 2001).

The factor structure of the revised SI-SRQ was then tested in the external, community (mTurk) sample via confirmatory factor analysis (CFA). Model fit was determined based on a root mean square error of approximation (RMSEA) below 0.06, a comparative fit index (CFI) greater than 0.90, and Tucker Lewis index (TLI) greater than 0.90 (Hu & Bentler, 1999; Kline, 2005; Steiger, 2007). Internal consistency of the SI-SRQ using the community sample was measured via Cronbach's alpha of the derived subscales. Remaining analyses to determine convergent and discriminant validity were conducted in the community sample using bivariate correlations. Finally, to examine potential relationships between perceived disclosure reactions and disclosure characteristics, a series of point biserial and Pearson correlations were conducted in the community sample. A critical alpha of .05 was used for all analyses.

Results

Preliminary analyses.

Undergraduate sample. The median number of lifetime NSSI acts was 58.00 (range = 1-4962); the median number of lifetime NSSI methods was 3.00 (range = 1-12). The majority of participants reported last engaging in NSSI one or more years ago (58.70%, n = 158), followed by 12.30% (n = 33) who reported their last NSSI act was six months to less than one year ago. 9.30% (n = 25) who reported three months to less than six months ago, 7.40% (n = 20) who reported one month to less than three months ago, 6.70% (n = 18) who reported less than one week ago, and 5.60% (n = 15) reported who reported one week to less than one month ago. See Table 4 for additional sample characteristics.

Table 4

Study 2 undergraduate and community sample characteristics

	Undergraduate Sample (n=269)	**Community Sample (n =211)**
Age (M, SD)	20.50 (3.09)	30.81 (8.25)
Female (*n*, %)	228 (84.80)	160 (74.07)
African American (*n*, %)	17 (6.50)	24 (11.10)
Caucasian (*n*, %)	190 (72.50)	164 (75.60)
Asian (*n*, %)	27 (10.00)	13 (6.00)
Multiracial / Other (*n*, %)	28 (10.40)	15 (6.90)
NSSI Frequency (M, SD)	278.14 (693.21)	976.34 (3479.03)
NSSI Methods (M, SD)	3.65 (2.32)	3.75 (2.95)
NSSI Interpersonal Functions (M, SD)	6.11 (6.23)	9.21 (9.57)
NSSI Intrapersonal Functions (M, SD)	13.87 (7.02)	13.54 (6.92)
Number of Disclosures (M, SD)	5.91 (8.69)	5.20 (8.33)
Peer Disclosure (*n*, %)	187 (69.50)	144 (66.40)
Family Disclosure (*n*, %)	83 (30.90)	57 (26.30)
Healthcare Provider Disclosure (*n*, %)	65 (24.20)	51 (23.50)

Note: Percentages are based on valid responses; NSSI frequency, methods, interpersonal, and intrapersonal = Inventory of Statements about Self-Injury; Number of disclosures, peer disclosures, family disclosures, healthcare provider disclosure = Non-Suicidal Self-Injury Disclosure Characteristics measure

Community sample. The median number of lifetime NSSI acts was 100.00 (range = 1-25354); the median number of lifetime NSS methods was 3.00 (range = 1-12). The majority of participants reported last engaging in NSSI one or more years ago (58.50%, *n* = 127), followed by 11.50% (*n* = 25) who reported less than one week ago, 11.10% (*n* = 24) who reported one month to less than three months ago, 7.40% (*n* = 16) who reported one week to less than one month ago, 6.0% (*n* = 13) who reported three months to less than six months ago, and 5.50% (*n* = 12) who reported six months to less than one year ago. See Table 4 for additional sample characteristics.

Primary analyses in undergraduate sample.

Exploratory factor analysis. The initial EFA resulted in three items that demonstrated low factor loadings on any factor (e.g., below .40; "Told you that it was not your fault," "Tried to comfort you by telling you it would be okay," "Told you he/she felt sorry for you") and four items with high cross-loadings on at least two factors (e.g., above .40; "Told you that you are loved," "Reassured you that you are a good person," "Helped you get information of any kind about coping with your behavior," "Shared his/her own experience with you"). These seven items were removed and an EFA was conducted on the remaining 38 items.

Results of the EFA showed five factors with eigenvalues above one (17.77, 5.20, 1.95, 1.28, 1.15). Parallel analyses also supported five factors having eigenvalues that fell above the corresponding eigenvalues generated from the randomly ordered data (raw data eigenvalues [percentile random data eigenvalue]: 15.10 [1.33], 6.79 [1.29], 1.53 [1.08], 1.33 [1.00], 1.06 [.93]), while the scree plot suggested a three factor solution. The factor pattern, factor structure matrices, and correlations among the factors, in addition to model

fit and item content, were then also considered in interpretation of the factor structure. Most importantly, when examining all factor solutions, there were only three factors that consisted of at least three items that loaded greater than .40 onto a single factor (and did not have high cross-loadings). After considering all of these indices, in addition to factor interpretability, a three-factor solution was determined to be the best fitting solution.

The final three-factor solution consisted of 38 items (χ^2 [592] = 1087.58, p <.001; RMSEA = .055; CFI = .962, TLI = .955). All items loaded positively on their respective factor. Interpretation of the factors suggested that the items on the first factor assessed negative reactions to NSSI disclosure ("negative reactions," N = 27 items); the second factor assessed reactions offering tangible aid or support ("tangible aid," N = 5 items); and the third factor assessed reactions offering emotional support ("emotional support," N= 7 items). See Table 5 for factor loadings and item specification. The negative reactions factor was significantly (p <.05) correlated with the tangible aid (r = .38) and emotional support factor (r = -.34). The tangible aid factor was significantly (p <.05) correlated with the emotional support factor (r = .12).

Table 5

Exploratory factor analysis results of the final model in the undergraduate sample of Study 2

Item	Rotated Factor Loading			Item Statistics
	F 1	F 2	F 3	M (SD)
Pulled away from you	**.69**	.19	-.05	1.25 (1.20)
Told you that you were just trying to get attention	**.66**	.20	-.11	1.05 (1.19)
Told others about your behavior without permission	**.55**	.27	-.16	1.14 (1.26)
Treated you differently in some way that made you uncomfortable	**.59**	.24	-.21	1.08 (1.26)
Tried to take control of what you did/decision you made	**.60**	.27	-.02	1.12 (1.17)
Focused on his/her own needs and neglected yours	**.78**	-.06	-.06	1.13 (1.21)
Told you to go on with your life	**.69**	.03	.17	1.24 (1.23)
Told you that you should feel ashamed because of your behavior	**.88**	-.03	-.01	0.66 (1.02)
Avoided talking to you or spending time with your	**.84**	.02	-.03	0.74 (1.02)
Made decisions or did things for your	**.72**	.13	-.01	1.03 (1.17)
Said they feel personally wronged by your behavior	**.79**	.01	,02	0.70 (1.11)
Told you to stop thinking about it	**.46**	.33	.04	1.77 (1.26)
Told you that you could have done more to prevent your behavior	**.55**	.28	.01	1.11 (1.17)
Acted as if you were damaged goods or somehow different now	**.84**	-.01	-.10	0.91 (1.16)
Treated you as if you were a child or somehow incompetent	**.83**	-.02	-,12	0.98 (1.19)
Expressed so much anger about your behavior that you had to calm them down	**.86**	-.07	-.01	0.68 (1.05)
Told you to stop talking about it	**.83**	.01	.02	0.78 (1.11)
Told you that you are just trying to manipulate others	**.76**	.07	.15	0.58 (0.94)
Told you that you were acting irresponsibly	**.73**	.02	-.09	1.11 (1.17)
Minimized the importance or seriousness of your experience	**.79**	-.07	-.14	1.16 (1.19)
Said he/she knew how you felt when he/she really did not	**.60**	.17	.09	1.51 (1.23)
Had been so upset that he/she needed reassurance from you	**.74**	.09	.16	1.13 (1.18)
Tried to discourage you from thinking about your behavior	**.53**	.28	.16	1.44 (1.30)
Made a joke or sarcastic comment about this type of experience	**.81**	.29	.01	0.89 (1.15)
Made you feel like you didn't know how to take care of yourself	**.90**	-.08	-.04	0.87 (1.13)
Said they feel you're tainted by your behavior	**.96**	-.22	.10	0.45 (0.91)
Encouraged you to keep your behavior as a secret	**.85**	-.09	.04	0.70 (1.09)
Distracted you with other things	.16	**.46**	.18	1.76 (1.29)
Offered to help you get medical care	.02	**.71**	.12	1.58 (1.31)
Made you promise to stop engaging in the behavior	-.10	**.68**	-.03	2.24 (1.46)
Encouraged you to seek counseling	-.12	**.71**	.03	2.44 (1.30)
Provided information and discussed options	.06	**.54**	.35	1.72 (1.29)
Listened to your thoughts and feelings	-.16	.02	**.78**	2.82 (1.03)
Saw your side of things and did not make judgements	-.19	-.06	**.83**	2.44 (1.18)
Showed understanding of your experience and feelings	-.13	.01	**.80**	2.41 (1.13)
Was able to really accept your experience	-.02	-.09	**.83**	2.12 (1.22)
Spent time with your	-.13	.20	**.77**	2.61 (1.15)
Told you that you did not do anything wrong	.23	-.05	**.73**	1.75 (1.35)
Believed you were trying your best	.15	.05	**.70**	1.80 (1.18)

Note: F = Factor; Bolded loadings represent the items' designated derived factor

38

Primary analyses in community sample.

Confirmatory factor analysis. The three-factor structure determined in the EFA

was tested on the external, community sample. The model demonstrated adequate fit, χ^2

$(663) = 1667.50$, $p < .001$; RMSEA = .085; CFI = .906, TLI = .901. Item loadings on each

factor were appropriate (greater than .40 on their respective factors, with cross-loadings

less than .40). See Table 6 for factor loadings and factor means / standard deviations.

Additional analyses showed that age was not significantly related to SI-SRQ negative

reactions ($r = -.08$, $p = .36$), tangible aid ($r = -.05$, $p = .53$), or emotional support ($r = -$

$.11$, $p = .18$) factors. Likewise, mean factor scores did not differ based on gender

[negative reactions, $t(215) = .21$, $p = .84$, $d = .20$; tangible aid, $t(215) = -.60$, $p = .55$, d

$= .01$; emotional support, $t(215) = .64$, $p = .52$, $d = .23$] or race, $F(9, 511) = .63$, $p = .77$,

$\eta^2 = .02$.

Table 6

Confirmatory factor analysis standardized loadings in the community sample of Study 2

	Factor Estimate (Standard Error)		
Item	NR	TA	ES
Pulled away from you	.69 (.77)		
Told you that you were just trying to get attention	.66 (.77)		
Told others about your behavior without permission	.55 (.71)		
Treated you differently in some way that made you uncomfortable	.59 (.75)		
Tried to take control of what you did/decision you made	.60 (.70)		
Focused on his/her own needs and neglected yours	.78 (.78)		
Told you to go on with your life	.69 (.64)		
Told you that you should feel ashamed because of your behavior	.88 (.87)		
Avoided talking to you or spending time with your	.84 (.85)		
Made decisions or did things for your	.72 (.77)		
Said they feel personally wronged by your behavior	.79 (.79)		
Told you to stop thinking about it	.46 (.58)		
Told you that you could have done more to prevent your behavior	.55 (.66)		
Acted as if you were damaged goods or somehow different now	.84 (.87)		
Treated you as if you were a child or somehow incompetent	.83 (.86)		
Expressed so much anger about your behavior that you had to calm them down	.86 (.84)		
Told you to stop talking about it	.83 (.83)		
Told you that you are just trying to manipulate others	.76 (.83)		
Told you that you were acting irresponsibly	.73 (.77)		
Minimized the importance or seriousness of your experience	.79 (.81)		
Said he/she knew how you felt when he/she really did not	.60 (.83)		
Had been so upset that he/she needed reassurance from you	.74 (.71)		
Tried to discourage you from thinking about your behavior	.53 (.59)		
Made a joke or sarcastic comment about this type of experience	.81 (.70)		
Made you feel like you didn't know how to take care of yourself	.90 (.88)		
Said they feel you're tainted by your behavior	.96 (.90)		
Encouraged you to keep your behavior as a secret	.85 (.80)		
Distracted you with other things		.46 (.54)	
Offered to help you get medical care		.71 (.73)	
Made you promise to stop engaging in the behavior		.68 (.64)	
Encouraged you to seek counseling		.71 (.67)	
Provided information and discussed options		.54 (.56)	
Listened to your thoughts and feelings			.78 (.84)
Saw your side of things and did not make judgements			.83 (.89)
Showed understanding of your experience and feelings			.80 (.85)
Was able to really accept your experience			.83 (.83)
Spent time with your			.77 (.84)
Told you that you did not do anything wrong			.73 (.65)
Believed you were trying your best			.70 (.65)
Factor Means (SD)	1.15 (.93)	1.77 (.94)	1.87 (1.08)

Note: NR = negative reactions; TA = tangible aid; ES = emotional support

Reliability analyses. Internal reliability for each factor was good to excellent: negative reactions ($\alpha = .97$), tangible aid ($\alpha = .72$), and emotional support ($\alpha = .92$).

Validity analyses. The tangible aid ($r = .23, p = .002$) and emotional support ($r = .32, p < .001$) factor were both significantly positively related to perceived social support, whereas the negative reactions factor ($r = -.20, p = .006$) was significantly negatively related to perceived social support. Stigma internalization was not significantly correlated with the tangible aid ($r = .01, p = .89$) or emotional support ($r = -.06, p = .82$) factor, but was significantly positively related to negative reactions factor ($r = .31, p < .001$). Both the tangible aid ($r = -.16, p = .008$) and negative reactions ($r = -.22, p = .002$) factors, but not the emotional support factor ($r = .03, p = .75$), were significantly correlated with distress tolerance.

Association between social reactions and disclosure characteristics. The tangible aid factor was not significantly correlated with presence of peer disclosure ($r = -.08, p = .16$) or number of disclosures ($r = .07, p = .15$). The emotional support factor was not significantly correlated with presence of peer disclosure ($r = -.03, p = .71$) or number of disclosures ($r = .05, p = .41$). The negative reactions factor was not significantly correlated with the presence of involuntary disclosure ($r = 0.07, p = .53$) or number of disclosures ($r = .07, p = .36$).

Discussion

The primary aim of study 2 was to develop and validate a new measure of perceived social reactions upon disclosure of NSSI, the SI-SRQ, in addition to provide preliminary information about the relationship of perceived social reactions and disclosure characteristics. It was anticipated that the SI-SRQ would consist of both

positive and negative social reaction factors, similar to the SRQ, and that this structure would be supported in both an undergraduate and community sample. Measure validity was expected to be demonstrated through significant associations between perceived social support with positive social reactions and stigma internalization with negative social reactions, in addition to nonsignificant associations between social reactions and distress tolerance. Finally, preliminary data were anticipated to show associations between positive social reactions with peer disclosures and number of disclosures, and negative social reactions with involuntary disclosures and number of disclosures. Overall, the initial psychometric properties of the SI-SRQ were supported, resulting in three subscales assessing positive and negative social reactions. Furthermore, there was evidence of convergent and (to some extent) discriminant validity for the SI-SRQ. However, preliminary associations between positive and negative social reactions with disclosure characteristics were not supported.

Results from the current study demonstrated that a three-factor solution for the SI-SRQ was the best-fitting model, which was replicated across samples. The final scale consisted of 38 items that fell onto three different factors: negative reactions, tangible aid, and emotional support. These factors, or subscales, were in line with the current study hypotheses in that they represented both negative (negative reactions) and positive (tangible aid, emotional support) perceived social reactions. The finding of a single negative reactions factor is in contrast to the factor structure of the SRQ, the scale the SI-SRQ was adapted from, which consists of five different negative social reaction factors (e.g., victim blame, egocentric, take control). Though speculative, it is likely that the clear and self-directed nature of NSSI allows for more homogenous, less nuanced,

negative responses relative to the complexity, ambiguity, and involuntary nature of sexual assault (e.g., Ullman, 2007).

Convergent validity of the SI-SRQ was supported through associations between perceived social support and perceived positive (tangible aid and emotional support) reactions, in addition to an association between stigma internalization and perceived negative reactions. The associations between perceived social support and the positive reaction factors is important, as the former assesses the *availability* of general support (e.g., "…when in need," "…when things go wrong"), whereas the positive reaction factors assess actually *receiving* support in the context of disclosing NSSI. Thus, the positive reaction factors are tapping into a construct similar to perceived social support, but specific to NSSI disclosure and unpacking emotional and tangible aspects of that social support.

A similar relationship exists between stigma internalization and the negative reactions factor, where the measure of stigma internalization used in the current study is assessing the broader impact of mental illness (e.g., "People ignore me or take me less seriously just because I have a mental illness"). On the other hand, the SI-SRQ negative social reaction items assess similar interactions (e.g., "Pulled away from you"), but in direct response to NSSI (which, when recurrent and problematic, represent a mental illness) disclosures. To our knowledge, no measure currently exists that assesses NSSI-related stigma, but our results suggest that NSSI stigma may be part of a general negative response to NSSI disclosure.

There was also some evidence of discriminant validity for the SI-SRQ. The emotional support factor was not correlated with distress tolerance, and while the tangible

aid and negative reactions factors were (negatively and positively, respectively) correlated with distress tolerance, the correlations were fairly small ($r = -.16$ to $.21$). Considering the overlap of distress tolerance, negative emotionality, and attributional bias (e.g., Hu, Zhange, & Yang, 2015; Zahn et al., 2015), it is not surprising that those with lower levels (as opposed to high levels) of distress tolerance may be somewhat more likely to perceive a response to their NSSI disclosure as more negative. Future studies will want to use other constructs to assess discriminant validity or include a measure of attribution bias, so this variance can be removed from the distress tolerance – SI-SRQ relationship. Providing initial support for the scales' divergent validity, factor scores were not related to participant demographic characteristics. Taken together, the current findings provide support for the psychometric properties of the SI-SRQ.

We anticipated there would be an association between positive social reactions with presence of peer disclosures, given that peers may be more understanding of reasons someone engages in NSSI (e.g., Bresin et al., 2013); however, this relationship was not supported. Similarly, there was a null association between negative disclosure reactions and involuntary disclosures, which was surprising. However, factor means indicate, regardless of social reaction type (positive or negative), individuals reported receiving these reactions only "sometimes" or "rarely." Given this, it may be possible that whether an individual is disclosing to a peer or experiencing an involuntary disclosure, the perceived reactions are neither overtly positive or negative, accounting for a lack of association with disclosure characteristics. Future research should continue to explore the relationships between these characteristics and perceived reactions, and, particularly how time may change the perceived valence of a reaction. The majority of participants in the

current sample reported last engaging in NSSI one year prior to the study, which may have contributed to recall bias in rating the disclosure reactions they received.

Finally, it is unclear why positive and negative social reactions to NSSI disclosures were not associated with frequency of disclosure. Some studies suggest that individuals who disclose their NSSI do so to only one or two people (Heath, Ross, Tostes, Charlebois, & Nedecheva, 2009) in which case, the reaction may have little impact on future disclosures. However, in the current sample individuals disclosed their behavior, on average, to 5-6 different people. It is possible that perceived positive reactions were endorsed at a higher level (item range for tangible aid and emotional support factors, 1.58 – 2.82) than perceived negative reactions (item range, .58 – 1.77), which may have mitigated the effects of negative reactions on disclosures. However, even considering this, we would have still expected to see a relationship between positive reactions and disclosure frequency. While it is possible that an individual's "most" positive or negative disclosure experience is influential in disclosure frequency, this is area for exploration in future research.

Conclusions

Findings from the current project provide valuable information about individuals who engage in NSSI and choose to disclose their behavior, in addition to their disclosure experience. Results emphasize that individuals who disclose their NSSI behavior may be those with a greater willingness to hurt themselves, regardless of behavior severity. This was highlighted by findings that individuals who may use NSSI as a primary coping mechanism, feel greater physical pain during NSSI, and have a history of suicide plan or attempt, but not those with more frequent NSSI, were more likely to disclose their

behavior. Importantly, these findings do not seem to represent the presence of general psychological distress (e.g., depressive symptoms, perceived stress), but rather may be specific to self-injury. As future research begins to further explore NSSI disclosure, it will be important to consider individual attitudes toward their NSSI. For example, it might be that those individuals who view their NSSI engagement as an aspect of their identity are less likely to disclose their behavior, whereas those who are bothered by their behavior or view it as an unhelpful coping mechanism may be more likely to disclose.

The role of social context in disclosing one's NSSI is also highlighted in the current findings. Individuals who identified self-cutting as their primary form of NSSI were more likely to disclose their NSSI. Given the common misconception that NSSI is circumscribed to self-cutting behaviors, those engaging primarily in this form of NSSI, versus less common methods (e.g., self-hitting, self-burning; Ammerman, Jacobucci, & McCloskey, 2017), may feel more comfortable discussing the behavior with others. Further, the environment that an individual grew up in may increase their willingness to discuss their NSSI, if prompted. For example, individuals who have a family member with psychological problems or know someone who has attempted suicide are more likely to disclose, underscoring the impact that the social environment may have on one's openness about their own difficulties.

Research in the area of NSSI disclosure has been limited due to a lack of assessment tools. This study provides preliminary support for the SI-SRQ as a self-report measure of perceived social reactions upon NSSI disclosure. The development of SI-SRQ fills a significant gap in the literature and will allow future research to address important questions about NSSI disclosure. The initial use of the SI-SRQ suggests that when

disclosing NSSI, individuals typically receive reactions that fall into one of three categories: negative reactions, reactions providing tangible aid, and reactions providing emotional support. While preliminary, current findings demonstrate that type of perceived social reaction is not related to disclosure from a peer, an involuntary disclosure, or frequency of disclosures. The current study has helped to provide foundational knowledge on social reactions to NSSI disclosure, but more research is needed to better understand the nuances in reactions to disclosure, and how these reactions influence interpersonal and intrapersonal distress, disclosure patterns, and treatment seeking.

The current project has helped provide valuable information about NSSI disclosure, however, findings must be interpreted within the context of study limitations. To our knowledge, this is the first comprehensive study of the NSSI disclosure experience, and, as such, has only provided cross-sectional, preliminary data. It will be important for future research to examine the impact of NSSI disclosure overtime. For example, the current study was not able to examine the influence of social reactions received from a peer or family member on that specific relationship, nor were we able to investigate the influence of perceived social reactions on treatment engagement, a relationship suggested by previous research (Muehlenkamp et al., 2012). A longitudinal study design would help to elucidate the temporal relationships between disclosure experiences, NSSI behavior, and subsequent psychological distress and treatment seeking. The current study was also limited by examination of only internalizing factors. Externalizing behaviors linked to impulsivity, particularly in the face of negative emotion, such as alcohol and substance use or aggression, may be helpful in

characterizing individuals who do and do not disclose their NSSI. The current project elected to focus on the perceptions of the individual disclosing their NSSI; while their experience of disclosing is necessary in understanding the disclosure experience, the extent to which these perceptions are consistent with the intentions of the disclosure recipient will be an area for future research to explore. Finally, it will be important to validate the use of the SI-SRQ, in addition to further disentangling nuanced aspects of the disclosure experience, among clinical populations (e.g., individuals meeting criteria for NSSI disorder) and individuals of various age ranges.

Despite these limitations, results from the present project have direct implications for clinical prevention and intervention efforts. With only approximately 60% of those engaging in NSSI disclosing their behavior to others, this highlights the importance of direct NSSI risk assessments, as those who engage in the behavior may not readily speak about it. At a broader level, findings also suggest there may be several social factors that have important implications for individual's willingness to disclose their behavior across contexts, including creating an open environment for a dialogue about NSSI through discussions of mental health more broadly. Furthermore, the current project provides a measure to assess perceived social reactions to NSSI disclosure and highlights the distinction, and potential significance, of reactions an individual may receive upon disclosing their NSSI. As such, it may be important to increase educational efforts about specific responses to NSSI disclosures, such as providing information about counseling or other services and more general, emotional support.

Footnotes:

[1] Given that females were more likely to disclose their NSSI, all subsequent group difference analyses between those who did and did not disclose their NSSI were also conducted controlling for gender. The same pattern of results emerged; analyses without controlling for gender are presented for ease of interpretation.

[2] All analyses including NSSI frequency were also examined using Mann-Whitney U tests. Using this analysis, there were no differences on lifetime NSSI frequency between those who did and did not disclose their NSSI and, among those who disclosed their NSSI, between those who did and did not disclose their NSSI to a provider. Given the variability of the lifetime NSSI frequency variable, and the common practice in the literature to examine NSSI frequency categorically (i.e., 1 vs. 2-4 vs. 5-10 vs. 11-20 vs. 21-49 vs. 50+), all analyses including NSSI frequency were also examined using a categorical variable. Using this approach, there were no differences on lifetime NSSI frequency between those who did and did not disclose their NSSI and, among those who disclosed their NSSI, between those who did and did not disclose their NSSI to a provider. Given these, results of *t*-tests were presented for ease of interpretability.

[3] Given those who disclosed to a healthcare provider were older, all additional group difference analyses based on healthcare provider disclosure were also conducted controlling for age. The same pattern of results emerged; analyses without controlling for age are presented for ease of interpretation.

CHAPTER 2

ADDITIONAL FINDINGS

A critical alpha of .05 was utilized for all additional findings.

Study 1

Aim 1

    The role of additional NSSI behavior characteristics in NSSI disclosure. Given the null relationship between typical measures of NSSI severity and NSSI disclosure, additional analyses examining other NSSI characteristics were conducted. First, lifetime NSSI frequency was examined as a categorical variable, which is consistent with common practice in the literature. There were no differences between those who did ($M = 4.82$, $SD = 1.51$) and did not ($M = 4.90$, $SD = 1.41$) disclose their NSSI on categorical NSSI frequency, t (448) = .55, $p = .59$, $d = .01$. Next, analyses examining the use of singular versus repeated NSSI methods were conducted. There were no differences between individuals who did (83.60%) and did not (81.80%) disclose their NSSI on the use of repeated NSSI methods, χ^2 (1) = .27, $p = .61$, $v = .03$.

Aim 2

    Further characterization of those who disclosed their NSSI. Given the potential impact of NSSI disclosure recency on perception of social reactions, the timing of NSSI disclosures was explored. Seventeen percent ($n = 47$) of participants reported that they had disclosed their NSSI after their first act; 8.70% ($n = 24$) reported they had been hurting themselves for less than one week before disclosing; 3.60% ($n = 10$) reported they had been hurting themselves for one to two weeks before disclosing; 8.70% ($n = 24$) reported they had been hurting themselves for two weeks to one month before disclosing; 13.00% ($n = 36$) reported they had been hurting themselves for one to three months before disclosing;

9.80% (n = 27) reported they had been hurting themselves for three to six months before disclosing; 12.30% (n = 34) reported they had been hurting themselves for six months to one year before disclosing; and 26.80% (n = 74) reported they had been hurting themselves for more than one year before disclosing. Among those who disclosed their NSSI, 5.50% (n = 15) reported their most recent disclosure was less than a week ago; 7.70% (n = 21) reported it was one week to less than one month ago; 11.00% (n = 30) reported it was one month to less than three months ago; 11.40% (n = 31) reported it was three months to less than six months ago; 13.20% (n = 36) reported it was six months to less than one year ago; 23.10% (n = 63) reported it was one year to less than three years ago; and 28.20% (n = 77) reported it was three or more years ago.

The role of additional NSSI characteristics in disclosing to healthcare provider. Given that typical measures of NSSI severity were not significantly associated with healthcare provider disclosure, additional NSSI characteristics were explored in relation to healthcare provider disclosure. First, lifetime NSSI frequency was examined as a categorical variable, which is consistent with common practice in the literature. There were no differences between those who did (M = 4.89, SD = 1.53) and did not (M = 4.84, SD = 1.46) disclose their NSSI to a healthcare provider on categorical NSSI frequency, t (448) = .26, p = .79, d = .07. Those who reported disclosing their NSSI to a healthcare provider (M = 1.49, SD = .59) did not report feeling physical pain more often during NSS compared to those who did not disclose to a healthcare provider (M = 1.43, SD = .66); t (255) = -.69, p = .49, d = .10.

Aim 2

See Table 7 for means and standard deviations for below analyses.

Table 7
Additional analyses examining percieved social reactions

	Negative Reaction	Tangible Aid	Emotional Support
	M (SD)	*M* (SD)	*M* (SD)
Disclosure Recipient			
Peer	1.29 (.94)	1.78 (.92)	1.91 (1.09)
No Peer	1.19 (.90)	1.97 (.94)	1.97 (1.00)
Family	1.41 (.86)	1.88 (.92)	1.91 (1.01)
No Family	1.10 (.94)	1.84 (.90)	1.94 (1.08)
Provider	1.14 (1.00)	2.15 (.92)	2.20 (.99)
No Provider	1.20 (.90)	1.76 (.88)	1.85 (1.06)
Individual Responses			
Disclose Again	1.13 (.88)	1.91 (.89)	2.08 (100)
Not Disclose Again	1.36 (1.04)	1.65 (.91)	1.46 (1.10)
Continued NSSI	1.26 (.94)	1.83 (.86)	1.80 (1.02)
Discontinued NSSI	1.06 (.90)	1.87 (.96)	2.11 (1.09)

Relationship between NSSI disclosure recipients and perceived social reactions. As preliminary analyses did not demonstrate associations between disclosure characteristics and perceived social reactions, additional analyses explored the relationship between NSSI disclosure recipient and perceived social reactions. There were no differences on reports of the negative reactions factor, $t(194) = -.02$, $p = .98$, $d =$

.01; tangible aid factor, t (204) = 1.42, p = .16, d = .20; and emotional support factor, t (204) = .36, p = .72, d =.06; between those who did and did not disclose their NSSI to peers. Those who disclosed to a family member reported receiving greater levels of negative reactions compared to those who did not disclose to a family member, t (194) = -2.06, p =.04, d = .34. There were no differences on reports of the tangible aid, t (204) = -.32, p = .75, d = .05, or emotional support factor, t (204) = .12, p = .91, d = .01, between those who did and did not disclose their NSSI to a family member. Those who disclosed to a healthcare provider reported receiving greater levels of the tangible aid factor, t (204) = -2.65, p =.01, d = .34, and emotional support factor, t (204) = -2.11, p =.04, d = .46, than those who did not disclose to a healthcare provider. There were no differences on reports of the negative reactions factor between those who did and did not disclose their NSSI to a healthcare provider, t (194) = .39, p =.70, d = .06 .

    Relationship between NSSI severity and perceived social reactions. Given the inconsistent relationships between NSSI severity and likelihood to disclose one's NSSI, these variables were also examined in relation to perceived social reactions. The correlations were not significant between lifetime NSSI frequency and the negative reactions (r = -.07, p = .30, tangible aid (r = .04, p = . 61), or emotional support (r = -.11, p = .12) factors. Number of NSSI methods was significantly, positively correlated with the negative reaction (r = .26, p <.001) and tangible aid (r = .19, p =.008) factors, but not the emotional support factor (r = .02, p =.78). There was a significant, positive correlation between interpersonal motivations for NSSI and the negative reaction (r = .63, p <.001), tangible aid (r = .31, p <.001), and emotional support (r = .21, p = .004) factors. There was a significant, positive correlation between intrapersonal motivations for NSSI and the

negative reaction ($r = .44$, $p < .001$) and tangible aid ($r = .33$, $p < .001$) factors; however, there was not a significant correlation with the emotional support factor ($r = .06$, $p = .46$).

   Individual responses to perceived social reactions. Given the null findings between other disclosure characteristics (e.g., recipient choice, voluntary / involuntary) and social reaction factors, individual responses (i.e., perceived helpfulness of reactions, willingness to disclose again, continuation of NSSI) to social reactions to NSSI disclosure were examined in their relation to factor scores. Helpfulness ratings were positively correlated with the tangible aid ($r = .44$, $p < .001$) and emotional support ($r = .68$, $p < .001$) factors, and negatively correlated with the negative reactions factor ($r = -.16$, $p = .04$). Individuals who reported that they would disclose their behavior again in the future, compared to those who stated they would not, reported higher levels of the emotional support factor, $t(204) = -3.69$, $p < .001$, $d = .59$. There were no differences on reported levels of the negative reactions, $t(194) = 1.51$, $p = .13$, $d = .24$, and tangible aid, $t(204) = -1.79$, $p = 08$, $d = .29$, factors. Participants who reported that they discontinued their NSSI engagement following their NSSI disclosure reported higher levels of the emotional support factor compared to those who continued engaging in NSSI, $t(204) = 2.05$, $p = .04$, $d = .28$. There were no differences between those who discontinued versus continued engaging in NSSI following their disclosure on reported levels of the negative reactions, $t(194) = -1.48$, $p = .14$, $d = .22$, and tangible aid, $t(204) = .32$, $p = .75$, $d = .04$, factors.

CHAPTER 3

ASSOCIATED LITERATURE REVIEW

A Review of Laboratory-Based Paradigms to Assess Non-Suicidal Self-Injury

Non-suicidal self-injury (NSSI) is the direct, intentional destruction of one's own body tissue without the intent to die (Klonsky & Muehlenkmap, 2007; Nock, 2009). This behavior occurs in 4-6% of adults (Jacobson & Gould, 2007; Klonsky, 2011; Swannell, Martin, Page, Hasking, & St. John, 2014) and 12%-18% of adolescents and young adults (Claes, Luyckx, & Bijttebier, 2014; Kuentzel et al., 2012; Muehlenkamp, Claes, Havertape, & Plener, 2012; Taliaferro & Muehlenkamp, 2015; Whitlock, Eckenrode, & Silverman, 2006), with one study finding as many as 46% of ninth and tenth grade students reporting at least one act of NSSI within the past year (Lloyd-Richardson, Perrine, Dierker, & Kelley, 2007). NSSI behaviors are numerous, including behaviors as varied as self-biting and hitting, preventing wounds from healing, and burning one's skin, but the most commonly endorsed behaviors are cutting and scratching / scraping one's skin, which usually occurs on the arms, wrists, or hands (Whitlock et al., 2008). Although cutting and scratching are most common, individuals who engage in NSSI report engaging in an average of three different forms of NSSI behavior (Robertson et al., 2013), with the number of NSSI forms used correlated with more frequent and medically severe NSSI (Lloyd-Richardson et al., 2007).

Early research on NSSI was largely confined to individuals with borderline personality disorder (BPD), which includes NSSI as part of a diagnostic criterion (American Psychiatric Association [APA], 2000). Later studies, however, showed that NSSI was not specific to BPD (e.g., Andover et al., 2005; Briere & Gil, 1998;

Muehlenkamp et al., 2011; Selby, Bender, Gordon, Nock, & Joiner, 2011) and may occur across a range of psychological disorders (Glenn & Klonsky, 2011; Kerr & Muehlenkamp, 2010; Klonsky, 2011). Once disambiguated from BPD, the independent impact of NSSI became discernible, with some research even suggesting that NSSI may represent the pathognomonic symptom of a distinct psychological disorder (Selby et al., 2011). Highlighting the growing importance of the study of NSSI, in addition to the negative impact of the behavior, the DSM-5 has since included NSSI Disorder as a disorder for future research (APA, 2013).

The influence of NSSI on individual functioning is widespread. Those who engage in NSSI experience more interpersonal difficulties, including lower perceived familial and peer support (Tatnell, Kelada, Hasking, & Martin, 2014) and increased interpersonal conflict (Adrian, Zeman, Erdley, Lisa & Sim, 2011). These individuals also report greater difficulty regulating their emotional experiences (Andover & Morris, 2014; Bresin, 2014; Davis et al., 2014), increased levels of emotional distress and arousal (Nock & Mendes, 2008; Plener, Schumacher, Munz & Groschwitz, 2015), and a higher likelihood of comorbid psychopathology, including depression, anxiety, and post-traumatic stress disorder (Bentley, Cassiello-Robbins, Vittorio, Saur-Zavala, & Barlow, 2015; Braga & Goncalves, 2014; Kerr & Muehlenkamp, 2010). Individuals who engage in NSSI are also at increased risk for more lethal acts of self –harm (Andover, & Gibb, 2010; Asarnow, et al., 2011; Boxer, 2010; Klonksy, May, & Glenn, 2013; Whitlock et al., 2013).

Although highly comorbid, NSSI and suicidal behaviors are viewed as distinct acts. Many individuals report engaging in both suicide attempts and NSSI (Andover, &

Gibb, 2010; Asarnow, et al., 2011; Boxer, 2010; Klonksy, May, & Glenn, 2013; Whitlock et al., 2013), and, further, engaging in NSSI is associated with subsequent suicide attempt(s) (Hilt, Nock, Lloyd-Richardson, & Prinstein, 2008; Muehlenkamp & Gutierrez, 2007; Nock, Joiner, Gordon, Lloyd-Richardson, & Prinstein, 2006); this high overlap necessitates careful consideration to disambiguate the two behaviors. Several characteristics may distinguish NSSI from suicidal behavior. For example, NSSI tends to occur at a high frequency and over a long period of time, with multiple methods, whereas suicide attempts usually occur with low frequency, using a single method (Guertin, Lloyd-Richardson, Spirito, Donaldson, & Boergers, 2001; Muehlenkamp & Gutiérrez, 2007). The central feature that differentiates NSSI from suicidal behavior, however, is the presence of suicidal intent (Andover et al., 2012). In line with this, for the current paper, suicide attempts will be considered a self-inflicted non-fatal injury performed with the intent to die (Silverman, Berman, Sanddal, O'Carrol & Joiner, 2007) whereas NSSI is the direct, intentional destruction of one's own body *without* the intent to die (Klonsky & Muehlenkamp, 2007; Nock, 2009).

Despite the aforementioned negative associations with NSSI, individuals report engaging in the behavior for a variety of reasons, the most common including affect regulation (to alleviate intense negative emotions; i.e. "to stop bad feelings," "to manage stress"), self-punishment or self-directed anger (to express self-derogation or low self-esteem; i.e. "to punish myself"), and social functions (to influence others; i.e. "to seek caring and support from others," "to get help from others") (Klonsky & Muehlenkamp, 2007; Lloyd-Richardson et al., 2007; Nock & Prinstein, 2004; 2005). Researchers have sought to create a parsimonious model of NSSI; the most common classifies NSSI based

on these functions. In this model, NSSI is categorized into one of four groups based on two dichotomies 1) automatic vs. social, which refers to the extent NSSI serves an intrapersonal or interpersonal function and 2) negative vs. positive, which refers to the extent NSSI is associated with the removal of something aversive or the acquisition of something positive (Nock & Prinstein, 2004; 2005). For example, the automatic-negative function would include acts of NSSI carried out to reduce negative affect and/or cognitive states, whereas the social-positive function would include acts of NSSI carried out to elicit help or support from others (Nock & Prinstein, 2004; 2005). Largely through self-reports and more recently experimental methods, research has continued to gain a better understanding of these NSSI motivations, and how they may also serve as reinforcing properties of the behavior.

Studies examining NSSI have relied almost exclusively on correlational research, utilizing self-report measures or interviews. Although these methods have provided valuable foundational knowledge about NSSI, such as who in engages in NSSI and why (e.g., Bentley, et al., 2015; Somer, Bildek, Kabukcu-Basay, Gungo, Basay, & Farmer, 2015; Swannell et al., 2014), their use comes with issues of recall bias, distortion, and reliance on an individual's memory and insight. Ecological momentary assessments, which addresses some of the limitations of retrospective recall bias, have provided more nuanced, day-to-day experiences of those who engage in NSSI and identified important risk factors for NSSI (e.g., Nock et al., 2009). The information gathered through these methods has guided the direction of more advanced methodologies, including the use of behavioral measures within quasi-experimental study designs. Researchers have used behavioral tasks of common NSSI correlates, such as impulsivity (Glenn & Klonsky,

2010; McCloskey, Look, Chen, Pajoumand, & Berman, 2012), problem solving abilities (Nock & Mendes, 2008), and pain tolerance and threshold (Hooley et al., 2010; Germain & Hooley, 2013). These methods have provided more objective data about those with a history of NSSI, but still allow only correlational interpretations these factors as they are not designed to assess NSSI behavior.

Behavioral analogues, which allow for the direct assessment of a behavior through a proxy or another strongly related behavior, have been utilized in psychological research for many years (e.g., Taylor, 1967). It is not until recently, however, that the use of such tasks has become more common in investigating correlates and potential mechanisms of NSSI. For example, research has utilized mental imagery, implicit associations, and pain stimuli as a way to assess differences among those with and without a history of NSSI. Research using these laboratory-based paradigms has greatly added to the field of NSSI as they allow a much closer representation of the experience of NSSI by attempting to mimic the behavior in the laboratory, without actual injury. Despite the advantages of such methods, and significant contributions to the NSSI literature, they have received relatively limited attention.

Current Review

Although several reviews have been published on NSSI research, including those on NSSI functions, common correlates, and treatment (e.g., Bentley et al., 2014; Klonsky & Muehlenkamp, 2007; Nock & Prinstein 2004; 2005), to our knowledge, no previous review has focused solely on the use of laboratory-based paradigms in the study of NSSI. As such, the current review aimed to provide a systematic evaluation of the current literature using laboratory paradigms as an analogue of NSSI. A review of this nature is

warranted given the advantages of these methods over traditional correlational and quasi-experimental methods, and, further, to highlight the importance of future use and continued development of novel, laboratory-based NSSI paradigms.

Method

Search Strategy and Study Eligibility

This systematic review included literature published between July 1984 and July 2015 to account for all studies published within the past 30 years. An electronic search on the following databases was carried out: psycINFO, psychArticles, ERIC, CINAHL, and MEDLINE. The following search terms were included:

a) self-injury or self-injurious behavior or non-suicidal self-injury or self-harm or deliberate self-harm or self-mutilation or self-aggression

b) experimental or laboratory or behavioral or real-time

Studies were screened for eligibility based on the inclusion criteria: a) included a task that was an analogue of self-injury (e.g., directly assessing a NSSI-proxy behavior); b) an experimental or laboratory based study design (e.g., no case studies); c) sample was not specific to those with intellectual disabilities, autism spectrum disorder, or traumatic brain injury; and d) in English language. Of particular consideration in the inclusion criteria was the definition of a task that was determined to be an analogue of self-injury. For the current study, we established the task must aim to serve as a proxy for self-injury within the laboratory. Examples of tasks that did not meet this inclusion criterion included behavioral measures of impulsivity, assessment of *only* pain tolerance or threshold, and ecological momentary assessments or daily diary designs.

Data Extraction

The shortlisted studies were then analyzed and the following data were extracted:

a) number of total participants (including number with NSSI history, if applicable)

b) study design

c) laboratory task employed

d) main study findings

Results

Data Extraction

A total of 1780 articles were initially identified by the search strategy. Of the 1780 studies identified, 50 papers were shortlisted for detailed analyses based on the abstracts. The majority of studies did not fit initial search criteria due to examining NSSI among those with intellectual disabilities or assessing NSSI (and related constructs) through self-report methodologies. Twenty-three of these papers were not included, as they did not address the objective of this review (i.e., did not include laboratory analogue of self-injury). These 23 paper's citations were then reviewed for additional, potentially relevant studies that were not included in the initial electronic search. From this, 20 papers were retrieved for a more detailed evaluation; 3 were not included because the task used was not an analogue of self-injury. This resulted in a total of 40 studies included in the review (See Figure 1.)

Figure 1
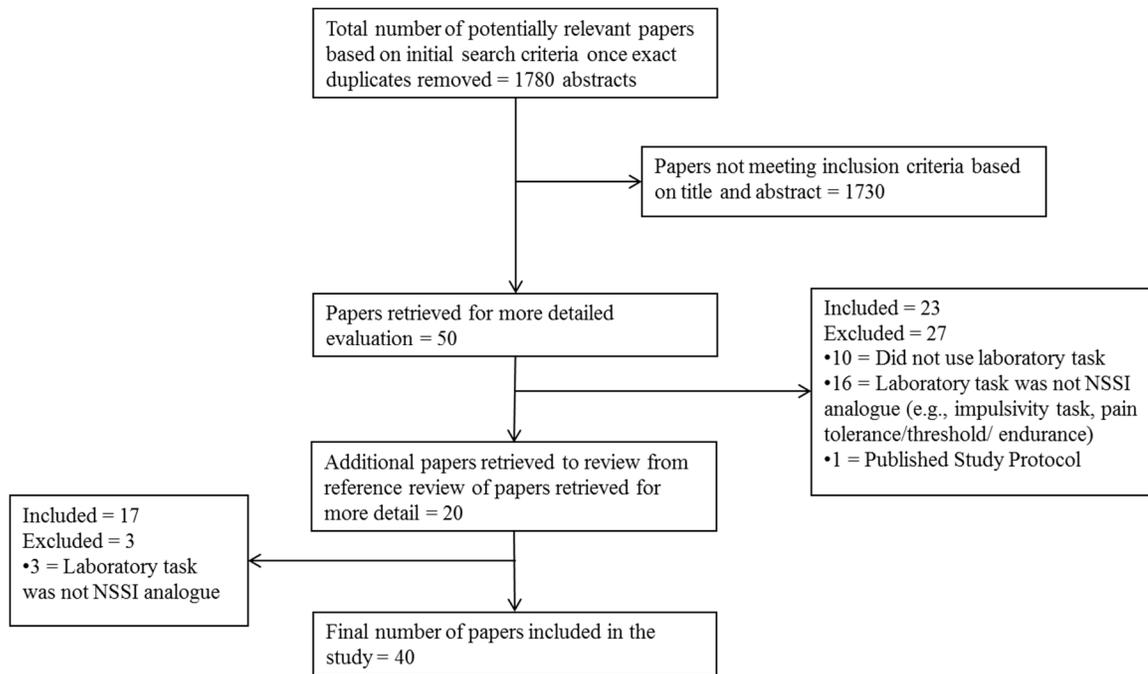
Flow chart demonstrating the article identification process

The final sample was then further evaluated for type of laboratory task employed and grouped by three main categories of laboratory tasks: NSSI-related (non-pain) stimuli [including NSSI pictures (2 studies), implicit associations (4 studies), and guided-imagery (5 studies)]; experimenter administered pain stimuli [including cold, hot, pressure, and shock stimuli (19 studies)]; and self-selected pain stimuli [including shock stimuli (10 studies)]. See Table 1 for included studies. A summary of these studies is provided below.

Table 8

Inclusion table for articles assessing non-suicidal self-injury in the laboratory

Authors	# Participants (NSSI+)	Study Design	Laboratory Task	Main Findings
NSSI Related (Non-Pain) Stimuli				
<u>NSSI- Related Images</u>				
Allen & Hooley, 2015	67 (33)	Between-Subjects (NSSI vs. no NSSI)	NSSI Pictures	NSSI+ showed poorer inhibition to negative emotion images and enhanced inhibition to NSSI images, in comparison to controls
Plener et al., 2012	18 (9)	Between-Subjects (NSSI vs. no NSSI)	NSSI Pictures	NSSI+ rated NSSI images as subjectively more arousing and, when viewing NSSI images, showed increased activity in middle orbitofrontal cortex and inferior and middle frontal cortex
<u>Implicit Association Tests</u>				
Dickstein et al., 2015	136 (46)	Between-Subjects (NSSI vs. suicide attempts and no NSSI vs. no NSSI)	SI-IAT	NSSI+ identified more with cutting vs. no cutting than comparison groups
Glenn & Klonsky, 2011	167 (81)	Longitudinal (Baseline; 1-year follow-up), Between-Subjects (NSSI vs. no NSSI)	SI-IAT	NSSI+ identified more with NSSI than control group at baseline, but identification with NSSI at baseline did not predict NSSI behavior at 1-year follow-up
Knowles & Townsend, 2012	72 (24); 69 (21)	Two Studies; S1 and S2 Between-Subjects (NSSI vs. no NSSI)	Go – No-Go Association Task	S1: NSSI+ and controls showed an implicit dislike association toward NSSI, and NSSI+ showed an association between arousal and NSSI; explicit attitudes better predicted NSSI status than implicit attitudes; S2: NSSI+ demonstrated a stronger NSSI-arousal association than controls; among NSSI+ automatic NSSI functions were related to a NSSI-sedation association and interpersonal NSSI functions were related to a NSSI-good association

Table 8, continued

Nock & Banaji, 2007	89 (53)	Between-Subjects (NSSI vs. no NSSI)	SI-IAT	NSSI+ more strongly identified with cutting than controls and the control group demonstrated a stronger association between cutting and bad; performance in both areas predict NSSI status
Guided-Imagery				
Brain, Haines, & Williams, 1998	70 (35)	3 (Current NSSI vs. Past NSSI vs. no NSSI) x 3 (event: accidental injury, anger, neutral)	Guided-imagery script	NSSI+ demonstrated decreased psychophysiological arousal when imagining cutting themselves, but only after the cutting; this response was different from control participants, but did not differ between current and past NSSI+
Brain, Haines, & Williams, 2002	43 (43)	Between-Subjects (Frequent NSSI vs. Infrequent NSSI)	Guided-imagery script	Frequent and infrequent NSSI+ did not differ in psychophysiological responses, but infrequent NSSI+ reported being more anxious and uptight after the imagined NSSI act
Haines, Brain, & Wilson, 1995	38 (15)	3 (prison NSSI vs. prison no NSSI vs. non-prison control) x 3 (event: accidental injury vs. aggression vs. neutral)	Guided-imagery script	The prison NSSI+ demonstrated a decrease in psychophysiological and psychological response following the imagined NSSI act, which was different from controls, and different from responses to control imagery
Kraus, et al., 2010	21 (11)	Between-Subjects (NSSI/BPD vs. no NSSI/BPD)	Guided-imagery script	NSSI/BPD+ showed less activation in the orbitofrontal cortex and increased activity in the dorsolateral prefrontal cortex while imagining the event leading up to NSSI, and decrease in the midcingulate while imaging the NSSI act
Welch, Linehan, Sylvers, Chittams, & Rizvi, 2008	42 (37)	Within-Subjects (event: NSSI and/or SA, accidental death/injury, or neutral)	Guided-imagery script	Participants did not demonstrate decreases in negative emotion during the NSSI act, but decreases following the imagined NSSI act

Experimenter Administered Pain Stimuli

Cold Stimuli

Table 8, continued

Chen, Dworkin, Haug, Gehrig, 1989	42 (0)	2 (pain-tolerant vs. pain-sensitive) x3 (stage: baseline vs. pain vs. post)	Cold Pressor Task	Pain-tolerant and pain-sensitive participants demonstrated no baseline delta or theta differences; when experiencing pain both groups exhibited heightened delta and beta levels, but the pain-sensitive participants showed higher delta levels.
Hamza et al., 2014	82 (56)	Between-Subjects (NSSI with self-punishment vs. NSSI without self-punishment vs. no NSSI)	Cold Pressor Task	After a stress task, NSSI+ with self-punishment rated the pain as less aversive compared to the other two groups
Franklin et al., 2010	112 (16)	Between-Subjects (NSSI vs. no NSSI high affect dysregulation (AD) vs. no NSSI low AD vs. no NSSI no pain)	Cold Pressor Task	After a stress task, NSSI+ reported an increase in distress following the pain, which did not differ from comparison groups experiencing pain; NSSI+, compared to the no NSSI high AD and no NSSI low AD, reported decreased in their startle-along reactivity and increase in prepulse inhibition following the pain stimuli Groups receiving CPT reported more distress after
Russ et al., 1992	28 (22)	Between-Subjects (NSSI/BPD no pain during NSSI vs. NSSI/BPD pain during NSSI vs. no NSSI/BPD)	Cold Pressor Task	NSSI/BPD+ no pain group subjectively rated pain as less intense than the other two groups, who did not differ from each other; NSSI/BPD+ no pain group reported lower levels of depression, anger, anxiety and confusion following pain than the NSSI/BPD+ pain group
Russ, Roth, Kakuma, Harrison, & Hull, 1994	11 (11)	2 (NSSI/BPD no pain during NSSI vs. NSSI/BPD pain during NSSI) x 2 (treatment: opiate antagonist naloxone vs. saline)	Cold Pressor task	NSSI/BPD+ no pain group subjectively rated pain as less intense than the NSSI/BPD+ pain group, even after receiving the opiate antagonist naloxone

Table 8, continued

Russ et al., 1999	76 (41)	Between-Subjects (NSSI/BPD no pain during NSSI vs. NSSI/BPD pain during NSSI vs. no NSSI depressed vs. no NSSI)	Cold Pressor Task	NSSI/BPD+ no pain group reported less pain intensity than other groups, and demonstrated high theta levels during pain compared to the no NSSI depressed and no NSSI groups
Heat Stimuli				
Bresin & Gordon, 2013	115 (59)	2 (NSSI vs. no NSSI) x 2 (pain stimuli vs. non-pain stimuli)	Heat Thermode	After a negative mood induction, NSSI+ reported greater reduction in negative affect following pain stimuli as compared to non-pain stimuli, which was not found among no NSSI participants
Leknes, Brooks, Wiech, & Tracy, 2008	8 (0); 16 (0); 13 (0)	Three Studies; S1: Within-Subjects; S2: Within-Subjects (pain level: threshold vs. mild vs. moderate, vs. intense); S3: Within-Subjects (temperature: heat vs. heat+cooling)	Heat Thermode	S1: Subjective pain relief began after pain and maximum relief occurred later than peak pain intensity; S2: Subjective pain intensity and relief ratings increased across conditions as did galvanic skin response; S3: Pain relief with cooling was rated as more pleasant than pain relief without cooling
Schmahl et al., 2006	24 (12)	2 (NSSI/BPD vs. no NSSI) x 2 (pain type: fixed vs. idiographic)	Heat Thermode	NSSI/BPD+ rated fixed pain as more painful and demonstrated lower activity in the right posterior parietal cortex compared to no NSSI group, but both revealed a patter of activity in the lateral and medial pain pathways; NSSI/BPD+ showed lower activity in the parietal cortex, greater activity in the left dorsolateral prefrontal cortex, and deactiviation in the right amygdala and perigenual anterior cingulate cortex when presented with idiographic pain compared to the no NSSI group
Pressure Stimuli				
McCoy, Fermous, & McNeil, 2010	44 (11)	Between-Subjects (NSSI vs. no NSSI)	Pressure Algometer	NSSI+ rated the pain as less intense

Table 8, continued

Schoenleber, Berenbaum, & Motl, 2013	67 (25)	Between-Subject (NSSI vs. no NSSI)	Pressure Algometer	NSSI+ reported greater unpleasant and lower pleasant emotions following pain than no NSSI; NSSI+ and no NSSI both experienced reductions in state shame following the pain task
Electric Shock				
Andreatta, Mulberger, Yarali, Gerber, & Pauli, 2010	101 (0)	Between-Subjects (group: forward delay condition vs. forward trace conditioning vs. backward conditioning)	Electric Shock	Stimuli presented in the forward delay conditioning were indicated as having negative implicit valence; Stimuli presented in the backward conditioning were indicated as having an implicit positive valence, but explicitly evaluated as emotionally negative; Stimuli present in the forward trace conditioning did not attain an implicit valence response
Arntz, Dressen, & Merckelback, 1991	55 (0)	2 (anxiety: low vs. high) x 2 (attention: attention vs. distraction)	Electric Shock	Participants in the distraction condition reported lower subjective pain ratings and weaker skin conductance responses as compared to the attention condition; there was no main effect for anxiety or an attention by anxiety interaction
Duker, van den Bercken & Foekens, 1999	60 (0)	Between-Subjects (attention: focusing vs. distracting)	Electric Shock	No differences between groups on subjective pain sensations or startle response; across administration there was a lower magnitude of startle response
Franklin, Lee, Hanna, & Prinstein, 2013	40 (0)	Within-Subjects	Electric Shock	Pain offset was associated with significantly elevated postauricular reactivity, which was greatest after higher-intensity shocks and diminished startle eye bling reactivity, which was stronger after lower-intensity shocks
Franklin, Puzia, Lee, Hanna, Spring & Prinstein, 2013	42 (21)	Between-Subjects (NSSI vs. no NSSI)	Electric Shock	At both 3.5-s and 6-s postshock measurements, NSSI+ and no NSSI demonstrated reduced mean startle eye blink and increased postauricular reactivity (e.g., pain offset), and NSSI+ participants displayed greater reduction in eyeblink reactivity at 6-s postshock; among NSSI+, there was not a correlation between NSSI frequency and pain offset
Multiple Pain Stimuli				

Table 8, continued

Bohus, et al., 2000	31 (12)	2 (group: NSSI/BPD with no pain during NSSI vs. no NSSI/BPD) x 2 (condition: calmness vs. distress)	Cold Pressor Task, Tourniquet Pain Test	NSSI/BPD+ in self-reported calmness rated pain as subjectively less intense than no NSSI/BPD and this difference was greater when participants were in self-reported distress
Bresin, Gordon, Bender, Gordon, & Joiner, 2010	167 (0); 184 (0)	Two Studies: Within-Subjects	Pressure Algometer; Heat Stimuli	S1: Participants reported subjective decreases in positive affect and negative affect following pressure pain, which was more pronounced in females; S2: Participants reported subjective decreases in positive affect and negative affect follow heat pain, and individuals high in emotion reactivity reported larger decreased in negative affect than those low in emotion reactivity

Self-Selected Pain Stimuli

Berman, Bradley, Fanning, & McCloskey. 2009	40 (0)	2 (alcohol: alcohol vs. placebo) x 2 (awareness: low self-awareness vs. high self-awareness)	Self-Aggressive Paradigm	Alcohol low self-awareness participants used more extreme shocks than placebo low self-awareness participants, but no differences were found between high self-awareness participants; participants in the alcohol condition used more extreme shocks than the placebo condition, but attributed the alcohol to their shock selection
Berman, Jones, & McCloskey, 2005	46 (0)	Between-Subjects (dose: 10mg diazepam vs. 5mg diazepam vs. placebo)	Self-Aggressive Paradigm	Participants receiving 10mg of diazepam administered higher average shock and more extreme shock than placebo groups

Table 8, continued

Berman & Walleye, 2003	94 (0)	3 (mood: depressed, elated, neutral) x 2 (condition: self-aggressive model vs. non-self-aggressive model)	Self-Aggressive Paradigm	Intensity of self selected shock increased over time for all participants; participants exposed to the self-aggressive model set higher average shocks than those not exposed to this mode, and this effect increased over time
Bracken, Berman, McCloskey, Bullock, 2008	85 (0)	2 (condition: self-harm vs. no self-harm) x 2 (dissociation assessment: 90s before shock vs. 90s after shock)	Self-Aggressive Paradigm	There were no differences on dissociation scores pre- or post-shock between the self-harm and no self-harm condition; women reported greater levels of dissociation compared to men in the self-harm, postshock condition
Inbar, Pizarro, Gilovish, & Ariely, 2012	46 (0)	Between-Subjects (condition: guilty vs. sad vs. neutral)	Self-Selected Electric Shock	Participants in the guilt mood induction inflicted more intense electrical shocks than those in the sad or neutral conditions; stronger shock was associated with great guilt relief
McCloskey & Berman, 2003	40 (0)	2 (alcohol: alcohol vs. placebo) x 2 (condition: self-aggressive model vs. no self-aggressive model)	Self-Aggressive Paradigm	Alcohol participants administer higher mean shock and more severe shock compared to placebo participants; self-aggressive model participants set higher mean shocks as the task progressed, but there was no interaction effect
McCloskey, Ben-Zeev, Lee, Berman, & Coccaro, 2009	32 (0)	2 (group: aggression vs. non-aggression) x 2 (condition: tryptophan depletion vs. placebo)	Self-Aggressive Paradigm	Participants in the tryptophan depletion condition selected higher average shocks than those in the placebo condition; aggressive participants were more likely to selected higher average shocks than non-aggressive participants, but no interaction with condition was observed
McCloskey, Look, Chen, Pajoumand, & Berman, 2012	79 (24)	Between-Subjects (NSSI vs. no NSSI vs. no NSSI healthy control)	Self-Aggressive Paradigm	NSSI+ participants set higher mean shock than healthy controls; self-rated and behavioral impulsivity were associated with mean level of selected shock

Table 8, continued

Sloan, Berman, Zeigler-Hill, Greer, & Mae, 2006	107 (0)	Between-Subjects (condition: high self-aggression norm vs. low self-aggression norm vs. mixed self-aggressive norm vs. no norm)	Self-Aggressive Paradigm	High self-aggression norm participants set higher shocks compared to the other three groups and low self-aggression norm participants set lower shocks compared to the other three groups; mean shock for men was higher than mean shock for women, but no interactions were present
Sloan, Berman, Zeigler-Hill, & Bullock, 2009	164 (0)	Between-Subjects (condition: unanimous self-aggression norm vs. nonunanimous self-aggression norm with first dissenter vs. nonunanimous self-aggressive group norm with last dissenter vs. no agreement)	Self-Aggressive Paradigm	Participants in unanimous self-aggression condition selected more extreme shocks than the other conditions and participants in the nonunanimous self-aggression with first dissenter condition selected more extreme shocks than the no agreement condition; women were less likely to conform to the groups norm when in nonunanimous condition
Weinberg & Klonsky, 2012	72 (39)	2 (NSSI vs. no NSSI) x 2 (condition: high shock vs. mild shock	Self-Selected Electric Shock	NSSI+ reported greater pain analgesia during pain than no NSSI; high shock condition lead to greater negative arousal reduction in no NSSI participants but not in NSSI+, however, high shock predicted greater reduction in negative arousal; higher subjective ratings of pain predicted smaller reduction in negative arousal

70

NSSI-Related (Non-Pain) Stimuli

NSSI Pictures. To better understand what individuals may experience when viewing NSSI-related content, which is of growing importance with the proliferation of NSSI focused websites and online videos (Lewis & Baker, 2011), researchers have implemented the use of NSSI-related pictures in the laboratory. These pictures often include images of razors, knives, or a lacerated arm (similar to online content), and are thought to trigger NSSI urges (Lewis et al., 2011). This methodology may also provide a unique insight into the reactions among those who engage in NSSI as they re-examine their own NSSI acts (e.g., looking at wounds/scars).

One way reactions to NSSI-related images have been examined is by assessing inhibitory control. Those with and without a history of NSSI were asked to judge the valence of four types of images (neutral, negative, positive, and NSSI-related); an unpredictable "stop signal" would occur on some trials, indicating to participants they should inhibit their response on that trial. Those with NSSI history demonstrated poor inhibition to negative emotional images and enhanced inhibition to NSSI-related images. Control participants, on the other hand, showed impaired inhibition to NSSI-related images (Allen & Hooley, 2015). Findings suggest that those who engage in NSSI showed impaired negative emotional arousal inhibition, and, further, that these individuals may have a conditioned response of associating NSSI with relief or reward (Allen & Hooley, 2015). Using similar images, participants were asked to provide a verbal rating of each photo's valence while receiving an fMRI scan (Plener et al., 2012). Those with a history of NSSI both reported NSSI-related photos to be more arousing and showed increased activation in the limbic system and prefrontal cortex for NSSI-related (vs. neutral)

pictures (Plener et al., 2012). Authors postulated these findings of hyper-reactivity of limbic structures (e.g., amygdala), among those with NSSI may be indicative of increased distress when viewing the images, with increased activity in the frontal cortex representing attempts to compensate for the limbic hyper-arousal (Plener et al., 2012). Taken together, these findings provide support for the notion that NSSI may serve to regulate one's emotions through processes which the individual may not have direct awareness.

These studies also highlight potential differences in explicit and implicit reactions to NSSI-related pictures among those with a history of NSSI. Participants rated NSSI-related images to be more arousing but also demonstrated increased control over responses related to these images. Findings indicate a potential disconnect in how individuals view their NSSI behavior (e.g., explicitly negative) and their automatic response to the behavior (e.g., implicitly rewarding), which may be attributed to neural responses of NSSI images as those with a history of NSSI demonstrated a pattern of activation suggesting both distress and an attempt to regulate this experience (Plener et al., 2012).

Implicit Associations. NSSI engagement is often associated with feelings of shame, guilt, and regret, (Leibenfult, Gardner & Cowdry, 1987; Schoenleber et al., 2014) and may elicit negative reactions in others (Linehan, 1993); consequently, those who engage in NSSI may be hesitant to report their behavior. Using more subtle measures of NSSI attitudes, such as implicit association tasks (IATs), are therefore highly beneficial. IATs measure one's underlying automatic evaluations through reaction-time tests (Greenwald, McGhee, & Schwartz, 1998) as a way to assess implicit attitudes, which are

thought of as actions or judgments that manifest when under the control of automatically activated evaluation and occur without the performer's awareness of the causation (Greenwald & Banaji, 1995). IAT procedures are based on the assumption that the performer will implicitly classify concepts they believe to be related in a quicker manner than concepts they do not view as related. When used to assess NSSI-related associations, IATs assess the association one holds between themselves and NSSI (i.e., identifying with NSSI) or attitudes regarding NSSI (i.e., NSSI is good). IATs have been shown to be less sensitive to distortion and impression management than traditional self-report measures (Greenwald & Banaji, 1995) and may offer better predictive validity for socially sensitive topics (Greenwald, Poehlman, Uhlmann, & Banaji, 2009), such as NSSI.

The Self-Injury IAT (SI-IAT; Nock & Banaji. 2007a; 2007b) has specifically been designed to examine NSSI-related implicated associations. This IAT implements two tests, the first assessing NSSI identity (e.g., "cutting / me"; "cutting / not me") and the other assessing NSSI attitudes (e.g., "cutting / good"; "cutting / bad"), where "good" is defined as pleasure and relief and "bad" is defined as painful and ineffective. Using the SI-IAT, self-injurers demonstrated a positive association between "cutting" and "me" (Glenn & Klonsky, 2011; Nock & Banaji, 2007b), whereas control participants showed a negative association (Nock & Banaji, 2007b). Further, individuals with a NSSI history and no suicide attempts more strongly identified with cutting than both suicide history (without NSSI) and healthy control groups (Dickstein et al., 2015).

Although there is strong evidence for group differences in identification with NSSI, the findings related to NSSI attitudes are less consistent. Non-self-injuring

adolescents have been shown to demonstrate a stronger, positive association between "cutting" and "bad" as compared to those with a history of NSSI (Nock & Banaji, 2007b), but this has not been replicated in other samples (Glenn & Klonsky, 2011; Knowles & Townsend, 2011). The SI-IAT's predictive power of NSSI engagement has also been examined. Responses related to both NSSI identification and attitudes independently and significantly predicted NSSI status above and beyond demographic information and psychiatric factors (Nock & Banaji, 2007b); however, performance on the tasks did not predict future NSSI behavior in college (Glenn & Klonsky, 2011) or adolescent inpatient (Dickstein et al., 2015) samples.

It is possible that inconsistent findings regarding implicit NSSI attitudes could be due to the impact of NSSI functions, influencing one's evaluative attitude of the behavior. Using a similar IAT measure, NSSI arousal ["self-harm" / "arousal" (e.g., I'm alert); "self-harm" / "sedation" (e.g., I'm relaxed)] was assessed to examine implicit NSSI functions (Knowles & Townsend, 2012). As hypothesized, individuals with a history of NSSI endorsed a stronger "self-harm" – "arousal" association (Knowles & Townsend, 2012). Furthermore, internal or automatic NSSI functions (e.g., "to escape", "to get relief…") were significantly related to a "self-harm" – "sedation" association, whereas interpersonal functions (e.g., "to punish someone", "to find out if someone cared") were associated with a positive "self-harm" – "good" association (Knowles & Townsend, 2012). Overall, these findings suggest that although NSSI is associated with overall higher arousal, those who report engaging in NSSI for affective relief may also view the act as calming.

The use of IAT measures in assessing NSSI associations has demonstrated itself to be a strong discriminatory tool between those with and without a history of NSSI based on identification with NSSI behavior. However, the use of IATs to discriminate groups based on NSSI attitudes or to predict future behavior is less certain. Despite this, IATs may be beneficial tools to assess implicit attitudes among those with a history of NSSI, as demonstrated by comparisons of implicit and explicit NSSI functions.

Guided Imagery. Guided imagery has been used as a way to assess individual reactions to an imagined act of NSSI. The imagery procedures typically include verbally presenting a script describing the NSSI scenario, consisting of four distinct stages: 1) setting the scene (a description of the environment and context in which NSSI will occur); 2) approach to the behavior (description of events immediately preceding NSSI); 3) the incident (details of the actual NSSI event); and 4) the consequence (description of the events immediately following NSSI) (Haines et al., 1995). The presentation of these NSSI-specific scripts have the advantage of examining the emotional, psychophysiological, and neuropsychological responses to all stages of an NSSI act, albeit imagined. The imaginal nature of the task may lend itself as a "low-risk" version of studying all steps an actual NSSI act.

Guided imagery methodologies have been used to examine both subjective and psychophysiological responses during NSSI, finding support for the notion that NSSI may serve to provide relief from negative affect (Brain, Haines, & Williams, 1998; 2002; Haines, Brain & Williams, 1995; Welch et al., 2008). Individuals with a history of NSSI showed an overall increase in arousal [subjective and physiological (e.g., heart rate, respiration)] when imagining the NSSI-triggering event and a decrease in this arousal

immediately after imagining the NSSI act (Brain et al., 1998; 2002; Haines et al., 1995). Interestingly, subjective decreases in arousal only occurred after the imagined NSSI act was completed, which was lagged in comparison to the psychophysiological arousal decrease (Brain et al., 1998; 2002; Haines et al., 1995), potentially suggesting there is an automatic process involved in arousal reduction. Imagery scripts have also been used to obtain more nuanced information about those who engage in NSSI. For example, current and past self-injurers did not differ in their pattern of arousal during the imagery (Brain et al., 1998); however, individuals who engaged in NSSI at a lower frequency reported greater anxiety during the triggering event and greater reductions in negative feelings following the NSSI act, compared to individuals with higher frequency NSSI (Brain et al., 2002). Affective regulation experienced as a consequence of NSSI be stronger at NSSI onset, suggesting it may be a particularly reinforcing property of the behavior.

Given the high co-occurrence of NSSI among individuals with borderline personality disorder (BPD; Clarkin, Widiger, Frances, Hurt, & Gilmore, 1983; Soloff, Lis, Kelly, Cornelius, & Ulrich, 1994), differences in neural activity during imagined NSSI have been examined among those with both BPD and a history of NSSI in comparison to healthy control participants (Kraus et al., 2010). Those with BPD/NSSI history demonstrated differing reactions upon imaging the approach behavior and NSSI act as compared to healthy participants. During approach behavior, the BPD/NSSI participants demonstrated significant activation in the left medial temporal gyrus and deactivation in the middle frontal gyrus. This pattern may relate to failure to inhibit or modulate one's emotional or cognitive reactivity during approach behavior, supporting the notion of using NSSI to reduce tension (Kraus et al., 2010). On the other hand, during

the NSSI act, a decrease in activation of the mid-cingulate was present among those with BPD/NSSI history. Such neural differences could suggest enhanced emotional involvement and reduced pain sensitivity, but, this may be an unconscious or automatic process as individuals with BPD/NSSI history did not report subjective differences in affect while imaging NSSI (Kraus et al., 2010). Although it is possible these procedures are not powerful enough to produce subjective arousal changes, it is also a possibility that NSSI imagery scripts allow for an investigation of unconscious processes at play during an (imagined) act of NSSI.

Studies using guided imagery have provided support for an increase in arousal prior to NSSI and a decrease in this arousal following a (imagined) NSSI act among past and current self-injures. This effect was also found to be stronger among those with infrequent NSSI behavior, suggesting NSSI may be particularly reinforcing at onset. Further, those with a history of NSSI demonstrate an altered neural pattern consistent with these findings. Despite these latter findings being confounded with the presence of BPD, the use of guided imagery has consistently suggested that NSSI may be used as a way to reduce tension.

Experimenter Administered Pain Stimuli

Methods discussed thus far have focused on non-painful, NSSI-related images and scripts, but researchers have also implemented tasks that attempt to recreate the experience of NSSI within the laboratory by administering an aversive physical stimulus. These stimuli have been presented in several forms (further detailed below), including cold sensations, heat sensations, pressure, and electric shock. The physically aversive

stimuli are thought to emulate the pain experienced during NSSI, thus providing insight into how individuals respond to pain as they might during an act of NSSI.

Cold stimuli. The most common method of assessing / administering pain using cold stimuli, is the Cold Pressor Test (CPT; Sadler et al., 1967; Lovallo, 1975; Stam, Petrusic & Spanos, 1981). In this test, participants immerse one or both arms in an ice bath that is maintained at an approximate temperature of 32.5 degrees Fahrenheit (0.3 degrees Celsius). They are instructed to keep their hands immersed in the water for a maximum of three minutes, or until they can no longer tolerate the cold water. The physical sensation experienced is expected to be painful, and, therefore, serve as a proxy for the pain experienced during an act of NSSI.

The CPT has been used to research pain processes during NSSI. Among a sample of those with BPD and NSSI, individuals who denied experiencing pain during NSSI reported experiencing less pain during the CPT as compared to both those who do experience pain during NSSI and healthy volunteers, who did not differ from each other (Russ et al., 1992; Russ et al., 1994). This pattern of results persisted even after participants were administered an opiate antagonist naloxone (Russ et al., 1994) suggesting that since pain experiences were not altered in response to the antagonist that NSSI pain analgesia may not be linked to the endogenous opioid system, as once hypothesized. In contrast, lack of pain experienced during NSSI was associated with greater affective relief immediately afterward (Russ et al., 1992; Russ et al., 1994). Another factor influencing pain experienced during NSSI is the reported function of the behavior; endorsing the self-punishment function of NSSI was associated with lower pain

ratings on the CPT (Hamza et al., 2014). This suggests that individuals who report pain analgesia during NSSI may be more likely to use NSSI as a form of self-punishment.

To evaluate the physiological experience of pain, the CPT has been used in conjunction with psychophysiological and neurophysiological assessment (Chen et al., 1989; Franklin et al., 2010; Russ et al., 1999). Two psychophysiological measures used in this research are startle-alone reactivity, thought to be a measure of affective valence, and prepulse inhibition, as an indicator of information processing. Those with a history of NSSI, compared to two non-NSSI groups (the first group matched to NSSI participants on levels of affect dysregulation and the other healthy controls), reported decreases in their startle-alone reactivity following the CPT. Further, participants with a history of NSSI demonstrated an increase in prepulse inhibition after the CPT whereas both comparison groups showed a decrease. Overall, results indicate that NSSI (via the pain-proxy) may not only serve an affect regulation role but also a cognitive regulation function (Franklin et al., 2010). Electroencephalograms (EEG) have also been used during the CPT to measure neurophysiological underpinnings during the painful stimuli. In implementing this method, however, inconsistent findings have emerged. For example, pain sensitive healthy participants (tolerating pain for a shorter duration), as opposed to pain tolerant participants, demonstrated higher delta levels (power densities) during the CPT (Chen et al., 1989). On the other hand, individuals with BPD who do not experience pain during NSSI (e.g., pain tolerant) demonstrated significantly higher theta, but not delta, levels during the CPT when compared to non-injuring clinical and non-clinical controls (Russ et al., 1999). In evaluating the latter finding, it was hypothesized that higher theta levels among pain absent participants may be linked to dissociative states

during pain (Russ et al., 1999), and thus supporting an 'anti-dissociation' (Nock & Prinstein 2004) function of NSSI for this subgroup of self-injurers. However, it is possible that such discordant findings could be an artifact of sample characteristics (e.g., non-clinical vs. clinical) or variability in CPT procedures (e.g., differing temperatures of the water bath), as opposed to representing true group differences.

In line with previous research, the use of the CPT has provided support for both emotional and cognitive regulation functions of NSSI. Studies using this method have also largely focused on the absence of pain during NSSI, potentially suggesting those with aberrant pain perceptions during NSSI represent a specific class of self-injurers. Those not experiencing pain during NSSI reported lower ratings of pain, even after an opiate antagonist naloxone, but demonstrated greater reductions in negative affect after pain. It was also hypothesized these individuals may experience higher levels of dissociation during pain, which may impact their subjective experiences. Although it is unclear if these findings are largely driven by NSSI or BPD presence, it appears individuals who do not experience pain during NSSI may disconnect from the pain in the moment, but still experience the subsequent affective relief. As such, this group may be at particular risk for chronic NSSI.

Heat stimuli. The use of heat as an aversive stimulus is most commonly administered through a heat thermode, often placed one's hand (i.e., back of hand, fingers). The thermode typically ranges in temperature from 104 to 122 degrees Fahrenheit, increasing at a rate of two to four degrees per second until reaching the maximum of 122 degrees, and is experienced as painful by most participants. In addition to serving as a general pain-proxy for NSSI, this method may better represent pain

experienced during NSSI as burning is a more common form of NSSI relative to exposing one's self to extreme cold (Whitlock et al., 2008).

Similar to the aforementioned research using the CPT, studies implementing heat stimuli have examined affective responses to pain and extended the literature by also including a non-painful (e.g., warm) stimuli for comparison (Bresin & Gordon, 2013). Following a negative mood induction, participants with a history of NSSI reported larger decreases in negative affect following painful heat stimuli as compared to non-painful stimuli; however, those without a history of NSSI did not demonstrate this pattern of relief (Bresin & Gordon, 2013). These findings support the experience of affective relief following pain, but also suggest that non-painful stimuli may work differently between those who do and do not engage in NSSI when experiencing emotional distress. It appears that individuals who engage in NSSI need to experience a more painful stimulus to receive a greater decrease in negative affect, whereas those who do not engage in NSSI may be more sensitive to pain, and as such, have a similar response to non-painful stimuli as they do painful stimuli (Bresin & Gordon, 2013).

Similar to the study of affect following pain, the occurrence of pain offset, which is the level of relief from pain itself (as opposed to relief from negative affect; Leknes et al., 2008), has also been examined. Healthy participants provided subjective ratings of pain intensity during heat thermode trials and of the relief experienced after pain trials, in addition to a measure of general arousal (galvanic skin response) (Leknes et al., 2008). Higher pain ratings and galvanic skin responses during the trials were both positively associated with pain relief after the trials (Leknes et al., 2008). The thermode was then used to produce a cooling sensation after the pain stimuli by reducing its temperature

below baseline. Using the cooling procedures, participants rated the pain relief as more intense, more pleasant, and longer in duration (Leknes et al., 2008). Results reflect that pain relief may differ from reductions in pain intensity, and that this pain relief, which may be occurring during NSSI, is associated with reward.

Finally, heat stimuli have been used to examine neural activation among those with BPD and NSSI history at both fixed and idiographic heat levels (Schmahl et al., 2006). Upon exposure to the fixed temperature, individuals with BPD/NSSI, relative to control participants without either BPD or NSSI, perceived the stimuli as more painful and also demonstrated lower activity in the right posterior parietal cortex (Schmahl, et al., 2006); however, both groups revealed a pattern of activity in the lateral and medial pain pathways. When presented with the adjusted, idiographic heat stimuli based on individual pain thresholds, greater differences emerged. The BPD/NSSI group showed lower activity in the parietal cortex, greater activity in the left dorsolateral prefrontal cortex, and deactivation in the right amygdala and perigenual portion of the anterior cingulate cortex, which are areas thought to evaluate pain intensity and be involved in the affective evaluation of pain (Schmahl et al., 2006). It is possible those with BPD and NSSI have a neural circuit of pathologically reduced pain perception, where pain is primarily modulated through the down-regulation of emotional components of pain (Schmahl et al., 2006).

The use of heat as a NSSI proxy has supported and extended CPT findings. Initial evidence for a link between pain offset (as opposed to solely a reduction in negative affect) and reward has been substantiated among healthy participants, which may ultimately generalize to those with a history of NSSI. Differing painful heat experiences

have also been examined among those with a history of NSSI. In the wake of a negative mood, self-injurers derived greater emotional relief from painful versus non-painful heat stimuli, which was not true for non-injurers. Therefore, a more intense pain experience may be imperative for those who engage in NSSI (perhaps why they initiated the behavior) to experience the same degree of affective relief. Self-injurers (relative to non-self-injurers) also show some evidence of altered neural activation in pain and affective circuits in response to heat stimuli, but only after controlling for pain threshold differences between groups. Limiting the specificity of the findings, some of the aforementioned studies included individuals with co-morbid BPD or non-self-injuring, non-pathological participants. Despite these limitations, the findings provide preliminary evidence of differential processing of painful heat stimuli among individuals with a history of NSSI.

Pressure stimuli. Another aversive stimulus used in the laboratory is pressure. Multiple measures of pressure have been used in pain research. One method, the pressure algometer (Forgione & Barber, 1971), is applied to the finger and knuckle, then lowered onto the skin to create an increasingly "aching" pain for a maximum of five minutes, to avoid tissue damage. Similarly, the Tourniquet Pain Test (Sternbach, Murphy, Timmermans, Greenhoot, & Akeson, 1974) induces muscular pain by pumping a blood pressure cuff while instructing participants to contract their hand. The blood pressure cuff is affixed to the participant's upper arm, and then rapidly pumped up to a value of 30 mmHg above the previously determined highest measurement (e.g., maximum strength of dominant hand). Simultaneously, participants are instructed to use half of their hand strength to depress a vigorimeter at a rate of 40 times per minute. This slow process

induces an ischemic pain in the arm of participants. These two forms of pressure-induced pain represent a proxy for NSSI-related pain.

Work utilizing the pressure algometer has supported previous findings related to the subjective experience of pain by demonstrating that individuals with a history of NSSI report the experience of physical pain as less intense than those without a history of NSSI (McCoy et al., 2010). Findings have also furthered this line of research by examining how the experience of pain may impact specific emotions. Following physical pain, both those with and without a history of NSSI reported decreases in shame (Schoenleber et al., 2014). Although self-injurers may experience physical pain as less intense, the use of pain as a means of lessening feelings of shame does not differ across individuals. It is possible that since shame reduction is not a predominant function of NSSI, with most individuals reporting a desire to decrease general negative affect (Klonsky, 2007), group differences did not emerge in relation to shame. It is also a possibility that individuals who engage in NSSI do not experience a reduction, but an increase in shame following physical pain, which has been shown to be true following NSSI acts (Leibenfult, Gardner & Cowdry, 1987).

Electric shock. The final method by which pain has been used in the laboratory to mimic the experience of self-injury is through electric shock. In this approach, an electrode is placed on the finger, hand, or arm, which induces a tingling/stinging sensation of increasing intensity. This shock is generally perceived as painful, and, therefore, considered a proxy of NSSI.

Using shock stimuli, the separate and combined influences of trait anxiety and attention to the painful shock have been examined in relation to pain perceptions. No

differences in either subjective or psychophysiological measures (e.g., skin conductance and heart rate) were found between high and low anxiety groups, signifying that anxiety does not have a strong influence on pain perception. However, when individual's attention was drawn to the shock (vs. distracted away from the shock), the pain had a stronger impact, as indicated by increased subjective ratings of pain and psychophysiological reactivity (Arntz et al., 1991). These latter findings have not been replicated, however. In utilizing startle response as an indicator of pain impact (vs. heart rate and skin conductance), no differences in subjective or startle responses between the attention and distraction conditions were found (Duker et al., 1999). These discordant findings suggest that heart rate and skin conductance may be more sensitive to differences in pain response. Alternately, as suggested by the inconsistency of subjective ratings, findings could be due variability in shock administration, where the latter study used a higher shock level in their procedures (Duker et al., 1991).

Adding to the limited literature on pain offset (e.g., pain relief), startle response has been used as an implicit measure of negative valence in association with the experience of electric shock (Andreatta et al., 2010). The presentation of the shock was paired with a geometric shape, where the shock occurred either right before the shape appeared, right after the shape appeared, or a delay after the shape appeared. Results indicated that the stimuli associated with pain-relief (e.g., delay after the shape) acquired positive implicit valence (attenuated startle response), but were explicitly rated as aversive (Andreatta et al., 2010). These findings provide information as to why some individuals may be attracted to a conditioned stimulus (e.g., NSSI), even if they explicitly judge it as negative. Two additional studies used psychophysiological indices of positive

affect (startle postauricular reactivity) and negative affect (startle eyeblink reactivity) to examine pain offset following electric shock (Franklin, Lee, et al., 2013; Franklin, Puzia et al., 2013). It was found that pain offset simultaneously increased positive affect and decreased negative affect among both those with NSSI history and healthy participants (Franklin, Lee, et al., 2013; Franklin, Puzia et al., 2013). All participants also demonstrated a greater increase in positive affect following higher intensity shocks and a greater reduction in negative affect after lower-intensity shocks (Franklin, Lee, et al., 2013). However, there were no differences in strength of pain offset reactions between those with and with a history of NSSI (Franklin, Puzia, et al., 2013). Based on these findings it seems that repeated episodes of NSSI do not generate heightened offset pain relief, and, as such, heightened pain relief may not be a major mechanism that increases risk for NSSI.

Research using electric shock as a NSSI proxy has found that the psychological factor of anxiety does not have a substantial impact on pain perceptions, but that focusing on the pain one is experiencing may heighten the intensity of that pain, both explicitly and implicitly; the exact impact attention has on pain perception is unclear, however, due to inconsistent findings. Utilizing psychophysiological responses to pain, more specifically pain offset, findings have highlighted potential discordance between explicit and implicit reactions to pain relief. This may be particularly useful in treatment of NSSI behavior as it suggests even though individuals who engage in NSSI may refer to their behavior as negative, or indicate that they wish to stop engaging in the behavior, NSSI may be an automatic or learned rewarding experience. This was further supported through studies demonstrating that participants experience simultaneous increases in

positive affect and decreased negative affect at pain offset. Those with and without a history of NSSI did not differ in the strength of this response, however. Taken together, findings suggest that although NSSI may be associated with a learned reward, or relief, this may not be due to heightened pain offset relief.

Multiple pain stimuli. More than one of the aforementioned pain stimuli have also been used in the same study as a way to replicate results across methods and compare reactions to different categories of pain. In response to both pressure and heat stimuli, healthy participants experienced significant decreases in both positive and negative affect following pain, with females and those higher in emotion reactivity reporting larger decreases in negative affect following the painful stimuli (Bresin et al., 2010). These findings support negative affect reduction following pain and that this effect is not specific to type of pain stimuli, which is important to consider given the numerous NSSI methods. Also utilizing two pain methods, the CPT and Tourniquet Pain Test (TPT), it was found that those with BPD and NSSI history (with pain analgesia during self-injury) reported reduced pain intensity during both tasks in comparison to healthy participants. This difference was further enhanced when BPD/NSSI individuals were in a self-reported state of distress, as opposed to calmness (Bohus et al., 2000). Although reduced pain intensity was found among all individuals with a history of NSSI, those in distress exhibited greater reductions in pain intensity, potentially reflecting a state-independent increased pain threshold. Of note were differences found in response to type of pain stimuli. Among BPD/NSSI individuals a greater number of participants reported pain analgesia during the TPT, which was characterized as a deep or "ischemic" pain, than during the CPT, viewed as more "superficial" pain (Bohus et al., 2000). These

discrepancies suggest that individuals with a history of NSSI may perceive superficial pain differently due to its similarity to the pain experienced during NSSI, and have potential implications for the future assessment of pain as an NSSI-proxy.

Self-Selected Pain Stimuli

To better replicate the in vivo experience of NSSI, altered procedures for pain stimulation methods have been implemented. In these modified tasks, participants are allowed to choose the level of shock they receive, increasing the ecological validity of the analogue by better representing the self-inflicted pain during NSSI. Among studies using this self-selecting methodology, all used electric shock as the pain stimulation. Several studies included in the review have used a reaction time task, which allows participants to select their level of shock, called the Self-Aggressive Paradigm (SAP; Berman & Walley, 2003; McCloskey & Berman, 2003). In this task, repeated (typically 28-32) reaction time trials are presented, and after each trial the individual loses they are asked to select a shock level ranging from 0 (no shock) to 10 (the subjects predetermined threshold), or a 20 (believed to be twice their predetermined threshold). Levels of self-injurious behaviors are evaluated through the mean level of shocks selected and the number of extreme ("20") shocks. The use of self-selected shock more closely represents the natural experience of NSSI behavior (e.g., self-initiated pain) and allows researchers to draw conclusions regarding cause-and-effect relationships.

The SAP has been used to examine how both intrapersonal and external factors influence NSSI-proxy behaviors in the laboratory. One such intrapersonal factor is impulsivity, a common NSSI correlate. Those with a history of NSSI, as compared to healthy participants but not non-injuring psychiatric controls, administered higher levels

of mean shock, supporting the use of self-selected shock among those with a history of NSSI (McCloskey et al., 2012). Further, level of shock administered by those with a NSSI history was related to both behavioral and self-reported impulsivity measures whereas actual NSSI behavior was only related to self-reported impulsivity (McCloskey et al., 2012). It is possible that results were confounded by method invariance, but could also indicate that individuals with a history of NSSI are indeed more behaviorally impulsive when impulsivity is viewed in conjunction with self-injurious behavior. Another intrapersonal (e.g., biological) factor, serotonin levels, was examined by experimentally altering 5-HT activity, a serotonin receptor, via tryptophan depletion (McCloskey et al., 2009). Participants received both a tryptophan depletory and placebo, one week apart. Among those with and without intermittent explosive disorder, the only psychiatric disorder for which aggression is a core symptom, tryptophan depletion facilitated higher shock selection, regardless of diagnosis (McCloskey et al., 2009). These findings have implications for the impact of serotonin in the role of NSSI in that lowered 5-HT appears to enhance self-injurious behaviors above and beyond psychiatric predisposition.

One external factor examined in relation to self-selected shock is the impact of group norms. Participants demonstrated a pattern of self-injurious behavior that was consistent with the groups norms to which they were exposed. Participants exposed to a high shock group norm (compared to a low shock norm, mixed norm, or no norm) set higher shock levels (Sloan et al., 2006). Similarly, individuals who were exposed to a self-aggressive model (versus non-aggressive model) increased their shock levels over time, used more extreme shocks, and imitated their opponent's behavior in selecting their

own shock levels (Berman & Walley, 2003). Extending these findings, participants were exposed to a unanimous self-aggressive group (e.g., all group members reported intent to administer high shock levels), a non-unanimous group with one dissenter, or a group with no systematic agreement. Consistent with previous studies, participants in the unanimous group used more extreme shocks than the other conditions. Further, it was found that women were less likely to conform to the group in the presence of a dissenter (Sloan et al., 2009). Taken together, these results suggest that one's own self-injurious behavior may be largely impacted by the behaviors, or beliefs, of those around them.

The use of self-selected stimuli has also allowed for examination of the impact substances have on self-injurious behavior. Participants received either an alcoholic or placebo beverage and then were exposed to either a self-aggressive or non-aggressive model. Supporting previous work, those exposed to the self-aggressive model administered higher levels and more extreme shock, as did participants who received the alcoholic beverage; however, there was no interaction between the conditions (McCloskey & Berman, 2003). To further explore potential moderators of the relationship between alcohol and self-selected shock, participants were assigned to a high self-awareness condition, which included a mirror and a monitor displaying the participant's face in the experiment room, or a low self-awareness (mirror and monitor removed) condition, in addition to receiving an alcoholic or placebo beverage (Berman et al., 2009). Those under the influence of alcohol and in the low self-awareness group used more severe shocks than those in the placebo / low self-awareness group (Berman et al., 2009). An extension of this work has also suggested other substances, such as benzodiazepines, increase risk for NSSI (Berman et al., 2005). Upon receiving either a

placebo, 5 mg of a benzodiazepine, or 10 mg of a benzodiazepine, participants receiving 10 mg administered higher levels and more severe shocks (Berman et al., 2005). These studies highlight the influence of substances as a potentially salient NSSI risk factor, which may be compounded with the experience of not having a strong sense of one' self.

Researchers have further adapted previous painful stimuli procedures by not only allowing participants to choose the level of electric shock they receive but by also permitting participants to initiate the actual shock (Bracken et al., 2008; Weinberg & Klonsky, 2012). In the examination of the relationship between self-selected shock and state dissociation, participants were assigned to either a self-harm (high shock) or control (mild shock) condition and completed measures of dissociation before and after they initiated the shock. Women experiencing the high shock reported greater dissociation than men, but only after they administered the shock (Bracken et al., 2008); this may be suggestive of women experiencing greater relief following pain that is represented as a mild dissociative state. Using similar methodology among those with and without a history of NSSI, those with a history of NSSI set higher levels of maximum shock but did not report significantly greater subjective levels of pain, indicating greater pain analgesia. Further, higher shock levels led to greater arousal reduction for NSSI participants as compared to controls, whereas higher subjective ratings of pain predicted smaller reductions in negative arousal (Weinberg & Klonsky, 2012). These findings suggest that more intense self-inflicted pain may facilitate greater reduction of negative arousal, but only if the subjective experience is not judged as highly aversive. Affective relief from self-selected shock has also been examined under differing mood conditions by allowing participants to both select and initiate the level of shock received (Inbar et al., 2012).

Participants were assigned to a guilty, sad, or neutral mood condition, and afterwards self-selected their shock. Participants in the guilt condition gave themselves stronger shocks than those in the sad or neutral condition, and participant's had greater relief from their feelings of guilt following the stronger shocks (Inbar et al., 2012). Supporting the aforementioned findings, more intense self-inflicted pain appears to lead to greater relief, and further, this effect may be stronger when an individual is experiencing high levels of guilt.

The use of self-selected shock has provided nuanced information about the experience of pain when the participant initiates the stimulus, more closely representing an act of NSSI. Through the use of this methodology, several risk factors of self-injurious behavior (and assumedly NSSI) have been identified, including self-injurious group behavior, gender, and substance use, with particularly strong evidence for the impact of alcohol. It has also been found that higher levels of self-selected shock led to greater reductions in arousal, which may be informative in considering the progression from superficial or non-severe NSSI behavior to more medically-severe NSSI and potentially suicidal behavior. These methods have also provided insight on potential NSSI mechanisms, suggesting that pain relief may be greater after experiencing greater levels of dissociation or guilt.

Discussion

This systematic review provided an overview of the use of laboratory paradigms as an analogue of NSSI. The current review included findings from 40 articles published within the last 30 years featuring three main types of laboratory-based methods: NSSI-related (non-pain) stimuli, experimenter administered pain stimuli, and self-selected pain

stimuli. NSSI-related stimuli included NSSI pictures, implicit association tests (IATs), and guided imagery whereas pain stimuli were aversive physical stimuli in the form of cold sensations, heat sensations, pressure, and shock. Despite seeing a recent increase in use, these methods are still limited in their implementation. In addition to outlining findings that have utilized these methods, this review aimed to provide support for the use of laboratory-based NSSI analogues as a means to study NSSI behavior by highlighting what these methods add to traditional correlational and quasi-experimental methods, while at the same time encouraging continued development of novel techniques to better understand NSSI.

Contributions to Field

The literature examining both NSSI-related and pain stimuli has supported their use in the study of NSSI and highlighted advantages of each method. With regard to NSSI-related stimuli, multiple studies showing increased arousal to such stimuli (Brain et al., 1998; 2002; Haines et al., 1995; Nock & Banaji, 2007b; Plener et al., 2012), support their validity in assessing NSSI. Furthermore, these types of methodologies allow researchers to examine responses to NSSI from a unique perspective, not available through other techniques. For example, NSSI-related pictures allow investigation of how self-injurers react to NSSI content as potentially seen online whereas guided imagery integrates all stages of NSSI behavior, such as triggering events and consequences, versus solely the act of harming oneself. IATs, on the other hand, provide a snapshot of implicit attitudes about NSSI that one may not be willing or ready to discuss with others. The use of actual pain stimuli (e.g., cold, heat, pressure, and shock sensations) provides the ability to more directly examine factors associated with the willingness to self-harm as well as

the how pain is processed among those with a history of NSSI without actual injury. Supporting the use of pain as a NSSI-proxy, included studies show differences among those with (vs. without) a history of NSSI in willingness to tolerate pain and response pattern to the experience of pain (e.g., Bresin & Gordon, 2013; Franklin et al., 2010; McCloskey et al., 2012; McCoy et al., 2010). Further, the ecological validity of these techniques has been increased by allowing participants to select, and even initiate, the pain they experience within the paradigms, better emulating the self-inflicted injury of NSSI. Given these significant methodological benefits, the reviewed laboratory-based NSSI paradigms have provided support for, and greatly expanded upon, the largely correlational NSSI literature through the testing of causal hypotheses.

A predominant focus of NSSI research has been on why an individual engages in NSSI. As previously noted, much work in this area has been based on self-reported reasons, or functions, as indicated by those engaging in NSSI. Through this work, it has been found that the most common reason for engaging in NSSI is relief from negative affect (i.e., "to stop feeling bad") (Klonsky, 2007; Nock & Prinstein, 2004; 2005) and that individuals often feel angry, frustrated, or overwhelmed prior to an actual act of NSSI (Briere & Gil, 1998; Klonsky, 2009; Nock, 2009). Further, the urge to engage in NSSI typically occurs within the context of negative thoughts or feelings (Muehlenkamp, Williams, Gutierrez & Claes, 2009; Nock 2009). The use of laboratory paradigms has both supported and expanded upon these self-reported functions. In addition to explicitly rating NSSI images as more arousing (Plener et al., 2012), self-injurers also demonstrated implicit attitudes of associating NSSI with "sedation", or decreasing arousal (Knowles & Townsend, 2011). Furthermore, those with a history of NSSI demonstrated increases in

arousal during an imagined NSSI-triggering event and decreases in arousal following an

NSSI act (Brain et al., 1998; 2002; Haines et al., 1995). Self-injurers response to the

direct experience of physical pain, similar to pain during NSSI, has also supported an

affect regulation role in NSSI. Those with a history of NSSI showed significant

reductions in negative affect following painful stimuli (Franklin et al., 2010), which was

further strengthened in the presence of negative mood (Bresin & Gordon, 2013). The

strong evidence for the affective regulation function of NSSI gained through correlational

methods created a foundation for the use of NSSI behavioral analogues to test these

hypotheses in an experimental framework, ultimately providing significant support for

the role of negative affect in NSSI. These findings have presented affective relief as a

factor serving to maintain NSSI behavior, and as such, a target for intervention,

especially because such affective relief has likely resulted in NSSI being a learned reward

behavior (Leknes et al., 2008).

Although more limited in scope, both correlational and experimental methods

have examined additional, non-affect regulatory based, NSSI functions. Individuals who

engage in NSSI have also reported to do so for the purpose of self-punishment, as a way

to "feel something", or even to influence their social environment (Klonsky &

Muehlenkamp, 2007; Lloyd-Richardson et al., 2007). Research using laboratory

paradigms have supported these self-reported functions both broadly and through direct

assessment of the functions. For example, self-reported functions were compared to

implicit NSSI associations finding that the self-reported affect regulation function was

related to associating NSSI with sedation qualities whereas interpersonal / social

functions were related to associating NSSI as being good or positive (Knowles &

Townsend, 2011). Such findings provide support for at least two separate categories of NSSI functions, evidenced by both explicit and implicit responses. One of the specific functions that has received more direct support is self-punishment. Those who reported engaging in NSSI as a form of self-punishment reported pain as less aversive than those who engaged in NSSI with other motivations (Hamza et al., 2014) and the experience of physical pain reduced specific feelings of guilt (Inbar et al., 2012), a common antecedent to self-punishment. A final function receiving support, although relatively understudied, is the anti-dissociation function (i.e., "to feel something") (Nock & Prinstein, 2004). This function may be particularly reinforcing as pain relief has been found to be greater after experiencing higher levels of dissociation (Bracken et al., 2008). Despite the general focus on affect regulation as a motivator for NSSI, the use of NSSI-proxies has indicated these additional NSSI functions may be equally reinforcing for NSSI behavior and are therefore important to consider in future research.

Given the self-identified relief experienced after NSSI, even though physical harm is thought to be universally aversive, it has been assumed that those who engage in NSSI experience the occurrence of pain differently than those who choose not to harm themselves. This notion has received preliminary support through quasi-experimental research, demonstrating that individuals with a history of NSSI have a higher pain threshold and can endure pain for longer (e.g., pain tolerance) compared to those without a NSSI history (Germain & Hooley, 2013; Hooley et al., 2010). As many studies have relied on retrospective reports of pain during NSSI, physical pain has been used to examine how these reports compare to subjective experiences of physical pain in the laboratory. Supporting self-reported experiences, individuals who indicated an absence of

pain during NSSI also reported significantly lower subjective pain ratings while experiencing physical pain in the laboratory. Adding to these findings, self-injurers rated the experience of physical pain as less intense compared to those without a history of NSSI (McCoy et al., 2010). These findings support and extend previous pain threshold research by demonstrating that even upon experiencing similar pain levels, those with a history of NSSI do not view the pain as aversive, which may significantly impact the natural pain barrier of NSSI behavior (Franklin et al., 2013).

Prior to the use of laboratory paradigms, there was a dearth of research investigating how NSSI is experienced on a biological level among those with a history of NSSI. Using laboratory measures it was shown that individuals with a history of NSSI displayed differing neural activity (e.g. increased activation in the limbic system and prefrontal cortex) when viewing NSSI-related images (Plener et al., 2012) as well as when imagining NSSI-triggering acts (Kraus et al., 2010) and idiographic physical pain (Schmahl et al., 2006). Despite the utilization of diverse stimuli, these three studies suggest that individuals who engage in NSSI demonstrate a pattern of neural activation consistent with the experience of distress or arousal in response to NSSI stimuli or pain, and also activation processes that may be related to regulation of emotional experiences. Further, altered pain perceptions among those with a history of NSSI may be largely due to a neural circuit of pathologically reduced pain perception, such that those with a history of NSSI showed lower activation in portions of the amygdala and anterior cingulate cortex, areas thought to evaluate pain intensity and the affective evaluation of pain (Schmahl et al., 2006), which could contribute to differences in subjective experiences. This brain circuit may also be influenced by serotonergic functioning;

reductions in circulating serotonin achieved via tryptophan depletion resulted in an

increase in self- administered electric shocks (McCloskey et al., 2009). Overall, findings

from laboratory self-harm paradigms suggest that individuals who engage in NSSI have

differing subjective and neurological responses to pain, potentially a pattern related to

failure to regulate emotional or cognitive reactivity, supporting the notion of NSSI as a

regulatory behavior (Kraus et al., 2010).

The use of laboratory paradigms provides another methodology to test the

association between intrapersonal factors, such as emotion regulation (discussed above),

anxiety and impulsivity, and NSSI. In the study of psychopathology among those who

engage in NSSI, it has been found that over half of these individuals report significant

anxiety symptoms (Kerr & Muehlenkamp, 2010; Nock, 2009), which has lead researchers

to consider its impact on NSSI. However, through the use of a NSSI-proxy, it has been

indicated that anxiety may not be a prominent or maintaining factor of NSSI as anxiety

levels did not influence the experience of pain (Artnz et al., 1991). Self-reported

impulsivity has also been found to be higher among those with a history of NSSI (Glenn

& Klonsky, 2010). Conflicting with this supposed relationship is the finding that self-

injurers demonstrated decreased cognitive control over responses related to negative

emotions and increased control NSSI-related images (Allen & Hooley, 2015).

Conversely, research using physical shock has supported the cross-sectional relationship

between NSSI and impulsivity. Self-selected shock levels were related to both self-

reported and behavioral impulsivity measures (McCloskey et al., 2012). These findings

may shed light on differences between the experience during an act of NSSI (e.g.,

experiencing physical pain) as opposed to viewing NSSI related stimuli (e.g., NSSI images).

Laboratory measures have also been used to test causal hypotheses related to putative external/situational influences on NSSI. Cross-sectional research has suggested that individuals may be more likely to act on thoughts of self-harm when they are using alcohol or drugs (Nock, 2009), and, further, that approximately one-quarter of self-injurers engage in NSSI while intoxicated (Klonsky, 2011). NSSI-proxies have allowed the directionality of the intoxication – NSSI relationship to be directly tested, showing that acute intoxication increases willingness to engage in self-harming behavior (Berman et al., 2009; McCloskey & Berman, 2003). Another hypothesized risk factor for NSSI behavior is NSSI contagion. It has been postulated that the risk of engaging in NSSI increases through peer NSSI engagement (Jarvi, Jackson, Swenson, & Crawford, 2013; Prinstein et al., 2010). Supporting this, those who were exposed to group norms or beliefs about increased self-injurious behavior, also demonstrated increases in their own self-injurious behavior through the selection of higher-self shock (Berman & Walley, 2003; Sloan et al., 2006). As evidenced through the investigation of these risk factors, the use of laboratory-based paradigms has allowed researchers to examine causal relationships of NSSI. Such research has specifically identified prominent NSSI risk factors, including substance use and group behavior, in addition to delineating those factors that may not serve to maintain NSSI (e.g., anxiety). Further, highlighted through this work is the impact negative emotions may have on the materialization of risk factors, such as impulsivity, but continued research is needed to better understand how additional contextual factors may impact NSSI behavior.

Limitations and Future Directions

As with most new behavioral methodologies, issues of administration and standardization have to be considered. It has been found that slight variations in administration procedures may influence the experience of pain. For example, changing the cuff width used during the Tourniquet Pain Test alters responses to the experience of pain (Estebe, Le Naores, Chemaly, & Ecoffey, 2001). Although slight variations in administration can be expected (i.e., measurement error), more substantial differences may have adverse impacts on overall knowledge of NSSI. For example, if physical/pain stimuli are initially introduced as too painful or too intense, all participants may experience significant pain too quickly, negating any group variation in responses to the stimuli. Conversely, it also possible that presented stimuli may not be extreme enough to elicit pain, or accurately represent the pain experienced during NSSI. Moving forward it will be necessary to gain a better understanding of how standardized pain stimuli compares to the pain experienced during NSSI, and how the use of idiographic or self-selected stimuli improves the ecological validity of these methodologies.

Despite such limitations, the inclusion of NSSI-proxy laboratory paradigms has significantly contributed to our knowledge of NSSI, evidenced through the investigation and support of hypothesized relationships put forth utilizing correlation methods. However, this limited research leaves expansive areas unexamined, calling for increased use of these methodologies moving forward. Moving forward it will be necessary to replicate current NSSI-proxy findings across various laboratory paradigms (e.g., cold vs. heat stimuli; experimenter vs. self- administered), as well as expand on the current findings. Distinctions between those with and without a history of NSSI have often been

confounded by comorbid diagnosis of borderline personality disorder (BPD), potentially causing inconsistencies in the literature (e.g., McCoy et al., 2010; Schmahl et al., 2006) and reducing the ability to assess risk factors for NSSI independent of BPD. Of equal importance, future research is needed to better understand potential contrasts between current and past self-injurers. Although initial research has found that these two groups do not differ in their pattern of arousal during imagined acts of NSSI (Brain et al., 1998), it is unknown if past self-injurers respond the same to physical pain as current self-injurers. Such research would allow the examination of long-term effects from engaging in NSSI. If past self-injurers continue to demonstrate similar perceptions and responses to pain as current injurers, then these individuals are likely at risk for engaging in the behavior again in the future.

The implementation of self-selected shock methodology has attempted to better emulate the experience of NSSI within the laboratory, however, the pain paradigms used significantly differ from genuine NSSI incidents. Although it is recognized by definition that these analogues cannot be same as actual NSSI, researchers should strive to continue to improve their ecological validity to the degree possible, while still adhering to ethical standards and minimizing participant risk. To date, very few studies have taken into account individual NSSI triggers or NSSI methods. Incorporating idiographic information into current methods may be as straightforward as utilizing NSSI-related pictures specific to one's NSSI methods or in guiding imagery scripts portraying triggering events that imitate those experienced before actual NSSI. Such changes, although minor, may better replicate an individual's natural experience of NSSI, allowing for a more accurate depiction of their response to stimuli in the laboratory. At a study design level, these

factors can be incorporated through the manipulation of experimental conditions. To best understand how factors preceding an act of NSSI influence the occurrence of the behavior, these conditions, such as experiencing emotional distress or having an interpersonal conflict, need to be replicated within the laboratory. Finally, the development of laboratory-based paradigms needs to continue by incorporating such novel features, moving to increase the ecological validity of the employed techniques. Thus far, the use of current laboratory-based NSSI paradigms has significantly expanded on the previous research, largely advancing the field, but to continue to do so, future research must further develop and refine NSSI methods to better parallel natural NSSI behavior and contextual factors, both effectively and safely.

REFERENCES CITED

Adrian, M., Zeman, J., Erdley, C., Lisa, L., & Sim, L. (2011). Emotion dysregulation and interpersonal difficulties as risk factors for nonsuicidal self-injury in adolescent girls. *Journal of Abnormal Child Psychology, 39,* 389-400.

Allen, K. J., & Hooley, J. M. (2015). Inhibitory control in people who self-injure: Evidence for impairment and enhancement. *Psychiatry Research*, *225*, 631-637.

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed. text revision.). Washington, DC: American Psychological Association.

American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.). Washington, DC: American Psychological Association.

Ammerman, B. A., Jacobucci, R., & McCloskey, M. S. (2017). Using Exploratory Data Mining to Identify Important Correlates of Nonsuicidal Self-Injury Frequency. *Psychology of Violence.* Online advance publication. http://dx.doi.org/10.1037/vio0000146

Andover, M. S., & Gibb, B. E. (2010). Non-suicidal self-injury, attempted suicide, and suicidal intent among psychiatric inpatients. *Psychiatry Research*, *178*, 101-105.

Andover, M. S., & Morris, B. W. (2014). Expanding and clarifying the role of emotion regulation in nonsuicidal self-injury. *Canadian Journal of Psychiatry, 59*, 569-575.

Andover, M. S., Morris, B. W., Wren, A., & Bruzzese, M. E. (2012). The co-occurrence of non-suicidal self-injury and attempted suicide among adolescents: Distinguishing risk factors and psychosocial correlates. *Child and Adolescent Psychiatry and Mental Health*, *6*, 1-7.

Andover, M. S., Pepper, C. M., Ryabchenko, K. A., Orrico, E. G., & Gibb, B. E. (2005). Self-mutilation and symptoms of depression, anxiety, and borderline personality disorder. *Suicide and Life-Threatening Behavior*, *35*, 581-591.

Andreatta, M., Mühlberger, A., Yarali, A., Gerber, B., & Pauli, P. (2010). A rift between implicit and explicit conditioned valence in human pain relief learning. *Proceedings of the Royal Society of London B: Biological Sciences*, *27,* 2411-2416.

Armiento, J. S., Hamza, C. A., & Willoughby, T. (2014). An examination of disclosure of non-suicidal self-injury among university students. *Journal of Community & Applied Social Psychology, 24,* 518-533.

Arntz, A., Van den Hout, M. A., Van den Berg, G., & Meijboom, A. (1991). The effects of incorrect pain expectations on acquired fear and pain responses. *Behaviour Research and Therapy*, *29*, 547-560.

Asarnow, J. R., Porta, G., Spirito, A., Emslie, G., Clarke, G., Wagner, K. D., ... & Brent, D. A. (2011). Suicide attempts and nonsuicidal self-injury in the treatment of resistant depression in adolescents: Findings from the TORDIA study. *Journal of the American Academy of Child & Adolescent Psychiatry*, *50*, 772-781.

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). Beck depression inventory-II. *San Antonio, TX: Psychological Corporation*, b9.

Berger, E., Hasking, P., & Martin, G. (2017). Adolescents' perspectives of youth non-suicidal self-injury prevention. *Youth & Society, 49,* 3-22.

Bently, K. H., Cassiello-Robbins, C. F., Vittorio, L., Sauer-Zavala, S., & Barlow, D. H. (2015). The association between nonsuicidal self-injury and the emotional disorders: A meta-analytic review. *Clinical Psychology Review, 10,* 65-78.

Bently, K. H., Nock, M. K., & Barlow, D. H. (2014). The four-function model of nonsuicidal self-injury key directions for future research. *Clinical Psychological Science*, *2*, 638-656.

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*, 1280-1297.

Berman, M. E., Jones, G. D., & McCloskey, M. S. (2005). The effects of diazepam on human self-aggressive behavior. *Psychopharmacology*, *178*, 100-106.

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

Bohus, M., Limberger, M., Ebner, U., Glocker, F. X., Schwarz, B., Wernz, M., & Lieb, K. (2000). Pain perception during self-reported distress and calmness in patients with borderline personality disorder and self-mutilating behavior. *Psychiatry Research*, *95*, 251-260.

Boxer, P. (2010). Covariation of self-and other-directed aggression among inpatient youth: Continuity in the transition to treatment and shared risk factors. *Aggressive Behavior*, *36*, 205-217.

Boyd, J. E., Otilingam, P. G., & DeForge, B. R. (2014). Brief version of the Internalized Stigma of Mental Illness (ISMI) scale: Psychometric properties and relationship to depression, self esteem, recovery orientation, empowerment, and perceived devaluation and discrimination. *Psychiatric Rehabilitation Journal*, *37*, 17-23.

Bracken, K. L., Berman, M. E., McCloskey, M. S., & Bullock, J. S. (2008). Deliberate self-harm and state dissociation: An experimental investigation. *Journal of Aggression, Maltreatment & Trauma*, *17*, 520-532.

Braga, C., & Gonçalves, S. (2014). Non suicidal self injury, psychopathology and attachment: A study with university students. *The Spanish Journal of Psychology*, *17*, E66.

Brain, K. L., Haines, J., & Williams, C. L. (1998). The psychophysiology of self-mutilation: Evidence of tension reduction. *Archives of Suicide Research*, *4*, 227-242.

Brain, K. L., Haines, J., & Williams, C. L. (2002). The psychophysiology of repetitive self-mutilation. *Archives of Suicide Research*, *6*, 199-210.

Bresin, K. (2014). Five indices of emotion regulation in participants with a history of nonsuicidal self-injury: A daily diary study. *Behavior Therapy, 45,* 56-66.

Bresin, K., & Gordon, K. H. (2013). Changes in negative affect following pain (vs. nonpainful) stimulation in individuals with and without a history of nonsuicidal self-injury. *Personality Disorders: Theory, Research, and Treatment*, *4*, 62-66.

Bresin, K., Gordon, K. H., Bender, T. W., Gordon, L. J., & Joiner Jr, T. E. (2010). No pain, no change: Reductions in prior negative affect following physical pain. *Motivation and Emotion*, *34*, 280-287.

Bresin, K., Sand, E., & Gordon, K. H. (2013). Non-suicidal self-injury from the observer's perspective: A vignette study. *Archives of Suicide Research*, *17*, 185-195.

Briere, J., & Gil, E. (1998). Self-mutilation in clinical and general population samples: Prevalence, correlates, and functions. *American Journal of Orthopsychiatry*, *68*, 609– 620.

Bryant, F. B., & Yarnold, P. R. (1995). Principal components analysis and exploratory and confirmatory factor analysis. In L. G. Grimm & R R. Yarnold (Eds.), *Reading and Understanding Multivariate Statistics* (pp. 99-136). Washington, DC: American Psychological Association.

Buhrmester, M., Kwang, T., & Gosling, S. D. (2011). Amazon's Mechanical Turk a new source of inexpensive, yet high-quality, data?. *Perspectives on Psychological Science*, *6*, 3-5.

Burke, T. A., Hamilton, J. L., Cohen, J. N., Stange, J. P., & Alloy, L. B. (2016). Identifying a physical indicator of suicide risk: Non-suicidal self-injury scars predict suicidal ideation and suicide attempts. *Comprehensive Psychiatry*, *65*, 79-87.

Cabrera-Nguyen, P. (2010). Author guidelines for reporting scale development and validation results in the Journal of the Society for Social Work and Research. *Journal of the Society for Social Work and Research*, *1*, 99-103.

Cattell, R. B. (1978). *The Scientific Use of Factor Analysis*. New York: Plenum

Chandra, P. S., Deepthivarma, S., Jairam, R., & Thomas, T. (2013) Relationship of psychological morbidity and quality of life to illness-related disclosure among HIV-infected persons. *Journal of Psychosomatic Research, 54,* 199-203.

Chen, A. C., Dworkin, S. F., Haug, J., & Gehrig, J. (1989). Topographic brain measures of human pain and pain responsivity. *Pain*, *37*, 129-141.

Claes, L., Luyckx, K., & Bijttebier, P. (2014). Non-suicidal self-injury in adolescents: Prevalence and associations with identity formation above and beyond depression. *Personality and Individual Differences*, *61*, 101-104.

Clarkin, J. F., Widiger, T. A., Frances, A., Hurt, S. W., & Gilmore, M. (1983). Prototypic typology and the borderline personality disorder. *Journal of Abnormal Psychology*, *92***,** 263-275.

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, 385-396.

Comrey, A. L., & Lee, H. B. (1992). A first course in factor analysis. Hillsdale, NJ: Erlbaum.

Costello, A. B., & Osborne, J. W. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research & Evaluation*, *10*, 1-9.

Cutrona, C. E., & Suhr, J. A. (1992). Controllability of stressful events and satisfaction with spouse support behaviors. *Communication Research*, *19*, 154-174.

Darley, J. M., & Fazio, R. H. (1980). Expectancy confirmation processes arising in the social interaction sequence. *American Psychologist*, *35*, 867.

Davis, T. S., Mauss, I. B, Lumian, D., Troy, A. S., Shallcross, A. J., Zarolia, P. ... & McRae, K. (2014). Emotional reactivity and emotion regulation among adults with a history of self-harm: Laboratory self-report and fMRI evidence. *Journal of Abnormal Psychology, 123,* 499-509.

Defense Manpower Data Center. 2016. Status of Forces Survey of Active Duty Members. Retrieved from http://download.militaryonesource.mil/12038/MOS/Reports/SOFS-A_Briefing_20160311.pdf.

Deliberto, T. L., & Nock, M. K. (2008). An exploratory study of correlates, onset, and offset of non-suicidal self-injury. *Archives of Suicide Research*, *12*, 219-231.

Derlega, V. J., Winstead, B. A., Greene, K., Serovich, J., & Elwood, W. N. (2004). Reasons for HIV disclosure/nondisclosure in close relationships: Testing a model of HIV-disclosure decision making. *Journal of Social and Clinical Psychology, 23,* 747–767.

Dickstein, D. P., Puzia, M. E., Cushman, G. K., Weissman, A. B., Wegbreit, E., Kim, K. L., ... & Spirito, A. (In Press). Self-injurious implicit attitudes among adolescent suicide attempters versus those engaged in nonsuicidal self-injury. *Journal of Child Psychology and Psychiatry*.

Duker, P. C., van den Bercken, J., & Foekens, M. A. (1999). Focusing versus distraction and the response to clinical electric shocks. *Journal of Behavior Therapy and Experimental Psychiatry*, *30*, 199-204.

Estebe, J. P., Le Naoures, A., Chemaly, L., & Ecoffey, C. (2000). Tourniquet pain in a volunteer study: Effect of changes in cuff width and pressure. *Anaesthesia*, *55*, 21-26.

Evans, E., Hawton, K., & Rodham, K. (2005). In what ways are adolescents who engage in self-harm or experience thoughts of self-harm different in terms of help-seeking, communication and coping strategies?. *Journal of Adolescence, 28,* 573–587.

Everitt, 1:1. S. (1975). Multivariate analysis: The need for data, and other problems. *British Journal of Psychiatry*, *126,* 2S7-240.

Fabrigar, L. R., Wegener, D. T., MacCallum, R. C., & Strahan, E. J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods*, *4*, 272.

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*, 175-191.

Fehler-Cabral, G., & Campbell, R. (2013). Adolescent sexual assault disclosure: The impact of peers, families, and schools. *American Journal of Community Psychology*, *52*, 73-83.

Floyd, F. J., & Widaman, K. F. (1995). Factor analysis in the development and refinement of clinical assessment instruments. *Psychological Assessment*, *7*, 286.

Finkenauer, C., & Rimé, B. (1998). Socially shared emotional experiences vs. emotional experiences kept secret: Differential characteristics and consequences. *Journal of Social and Clinical Psychology*, *17*, 295-318.

Forgione, A. G., & Barber, T. X. (1971). A strain gauge pain stimulator. *Psychophysiology*, *8*, 102-106.

Fortune, S., Sinclair, J., & Hawton, K. (2008a). Help-seeking before and after episodes of self-harm: A descriptive study in school pupils in England. *BMC Public Health, 8,* 369.

Fortune, S., Sinclair, J., & Hawton, K. (2008b). Adolescents' views on preventing self-harm: A large community study. *Social Psychiatry and Psychiatric Epidemiology, 43,* 96–104.

Frable, D. E., Platt, L., & Hoey, S. (1998). Concealable stigmas and positive self-perceptions: Feeling better around similar others. *Journal of Personality and Social Psychology*, *74*, 909-922.

Franklin, J. C., Hessel, E. T., Aaron, R. V., Arthur, M. S., Heilbron, N., & Prinstein, M. J. (2010). The functions of nonsuicidal self-injury: Support for cognitive–affective regulation and opponent processes from a novel psychophysiological paradigm. *Journal of Abnormal Psychology*, *119*, 850.

Franklin, J. C., Lee, K. M., Hanna, E. K., & Prinstein, M. J. (2013). Feeling worse to feel better pain-offset relief simultaneously stimulates positive affect and reduces negative affect. *Psychological Science*, 4, 521-529.

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,* 110-119.

Gaucher, D., Wood, J., Stinson, D., Forest, A., Holmes, J., & Logel, C. (2012). Perceived regard explains self-esteem differences in expressivity. *Personality & Social Psychology Bulletin, 38,* 1144–1156.

Germain, S. A. S., & 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*, 694-701.

Glenn, C. R., Kleiman, E. M., Cha, C. B., Nock, M. K., & Prinstein, M. J. (2016). Implicit cognition about self-injury predicts actual self-injurious behavior: Results from a longitudinal study of adolescents. *Journal of Child Psychology and Psychiatry*, *57*, 805-813.

Glenn, C. R., & Klonsky, E. D. (2010). A multimethod analysis of impulsivity in nonsuicidal self-injury. *Personality Disorders: Theory, Research, and Treatment*, *1*, 67.

Glenn, C. R., & Klonsky, E. D. (2011). Prospective prediction of nonsuicidal self-injury: A 1-year longitudinal study in young adults. *Behavior Therapy*, *42*, 751-762.

Greenwald, A. G., & Banaji, M. R. (1995). Implicit social cognition: Attitudes, self-esteem, and stereotypes. *Journal of Personality and Social Psychology*, *102*, A—21.

Greenwald, A. G., McGhee, D. E., & Schwartz, J. L. (1998). Measuring individual differences in implicit cognition: The implicit association test. *Journal of Personality and Social Psychology*, *74*, 1464.

Greenwald, A. G., Poehlman, T. A., Uhlmann, E. L., & Banaji, M. R. (2009). Understanding and using the Implicit Association Test: Meta-analysis of predictive validity. *Journal of Personality and Social Psychology*, *97*, 17-42.

Gorsuch, R. L. (1983). *Factor analysis* (2nd ed.). Hillsdale, NJ: Erlbaum.

Guertin, T., Lloyd-Richardson, E., Spirito, A., Donaldson, D., & Boergers, J. (2001). Self-mutilative behavior in adolescents who attempt suicide by overdose. *Journal of the American Academy of Child & Adolescent Psychiatry*, *40*, 1062-1069.

Haines, J., Williams, C. L., Brain, K. L., & Wilson, G. V. (1995). The psychophysiology of self-mutilation. *Journal of Abnormal Psychology*, *104*, 471 - 489.

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*, 33 – 42.

Hasking, P., Rees, C. S., Martin, G., & Quigley, J. (2015). What happens when you tell someone you self-injure? The effects of disclosing NSSI to adults and peers. *BMC Public Health*, *15*, 1039.

Hauser, D. J., & Schwarz, N. (2016). Attentive Turkers: MTurk participants perform better on online attention checks than do subject pool participants. *Behavior Research Methods*, *48*, 400-407.

Hayes, S. C., Strosahl, K., Wilson, K. G., & Bissett, R. T. (2004). Measuring experiential avoidance: A preliminary test of a working model. *The Psychological Record*, *54*, 553-578.

Heath, N. L., Baxter, A. L., Toste, J. R., & McLouth, R. (2010). Adolescents' willingness to access school-based support for nonsuicidal self-injury. *Canadian Journal of School Psychology, 25*, 260–276.

Heath, N. L., Ross, S., Toste, J. R., Charlebois, A., & Nedecheva, T. (2009). Retrospective analysis of social factors and nonsuicidal self-injury among young adults. *Canadian Journal of Behavioural Science*, *41*, 180–186.

Heath, N. L., Toste, J. R., & Beettam, E. L. (2006). "I Am Not Well-Equipped": High school teacher's perceptions of self-injury. *Canadian Journal of School Psychology, 21,* 73–92.

Hilt, L. M., Nock, M. K., Lloyd-Richardson, E. E., & Prinstein, M. J. (2008). Longitudinal study of nonsuicidal self-Injury among young adolescents rates, correlates, and preliminary test of an interpersonal model. *The Journal of Early Adolescence*, *28*, 455-469.

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*, 170.-179.

Horesh, N., & Apter, A. (2006). Self-disclosure, depression, anxiety, and suicidal behavior in adolescent psychiatric inpatients. *Crisis*, *27*, 66-71.

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, *6*, 1-55.

Hu, T., Zhang, D., & Yang, Z. (2015). The relationship between attributional style for negative outcomes and depression: A meta-analysis. *Journal of Social and Clinical Psychology*, *34*, 304.

Huff, C., & Tingley, D. (2015). "Who are these people?" Evaluating the demographic characteristics and political preferences of MTurk survey respondents. *Research & Politics*, *2*, 2053168015604648

Hutcheson, G., & Sofroniou, N. (1999). *The multivariate social scientist: Introductory statistics using generalized linear models*. Thousand Oaks, CA: Sage Publications.

Inbar, Y., Pizarro, D. A., Gilovich, T., & Ariely, D. (2013). Moral masochism: On the connection between guilt and self-punishment. *Emotion*, *13*, 14 – 18.

Jacobson, C. M., & Gould, M. (2007). The epidemiology and phenomenology of non-suicidal self-injurious behavior among adolescents: A critical review of the literature. *Archives of Suicide Research, 11,* 129–147.

Kerr, P. L., & Muehlenkamp, J. J. (2010). Features of psychopathology in self-injuring female college students. *Journal of Mental Health Counseling*, *32*, 290-308.

Kline, P. (1979). *Psychometrics and psychology*. London: Academic Press.

Kline, R. (2005). *Principles and practice of structural equation modeling, second edition (Methodology in the social sciences)*. New York, NY: The Guildford Press.

Klineberg, E., Kelly, M. J., Stansfeld, S. A., & Bhui, K. S. (2013). How do adolescents talk about self-harm: A qualitative study of disclosure in an ethnically diverse urban population in England. *BMC Public Health, 13,* 572

Klonsky, E. D. (2011). Non-suicidal self-injury in United States adults: Prevalence, sociodemographics, topography and functions. *Psychological Medicine*, *41*, 1981-1986.

Klonsky, E. D., & Glenn, C. R. (2009). Assessing the functions of non-suicidal self-injury: Psychometric properties of the Inventory of Statements About Self-injury (ISAS). *Journal of Psychopathology and Behavioral Assessment*, *31*, 215-219.

Klonsky, E. D., May, A. M., & Glenn, C. R. (2013). The relationship between nonsuicidal self-injury and attempted suicide: Converging evidence from four samples. *Journal of Abnormal Psychology, 122,* 231-237.

Klonsky, D. E., & Muehlenkamp, J. J. (2007). Self-injury: A research review for the practitioner. *Journal of Clinical Psychology: In Session, 63*, 1045-1056.

Knowles, S. E., & Townsend, E. (2012). Implicit and explicit attitudes toward self harm: Support for a functional model. *Journal of Behavior Therapy and Experimental Psychiatry*, *43*, 730-736.

Koning, K. L., McNaught, A., & Tuffin, K. (2017). Emergency department staff beliefs about self-harm: A thematic framework analysis. *Community Mental Health Journal*, 1-9.

Kraus, A., Valerius, G., Seifritz, E., Ruf, M., Bremner, J. D., Bohus, M., & Schmahl, C. (2010). Script-driven imagery of self-injurious behavior in patients with borderline personality disorder: A pilot FMRI study. *Acta Psychiatrica Scandinavica*, *121*, 41-51.

Kuentzel, J. G., Arble, E., Boutros, N., Chugani, D., & Barnett, D. (2012). Nonsuicidal self-injury in an ethnically diverse college sample. *The American Journal of Orthopsychiatry*, *82*, 291–297.

Leibenluft, E., Gardner, D. L., & Cowdry, R. W. (1987). Special feature the inner experience of the borderline self-mutilator. *Journal of Personality Disorders*, *1*, 317-324.

Leknes, S., Brooks, J. C., Wiech, K., & Tracey, I. (2008). Pain relief as an opponent process: A psychophysical investigation. *European Journal of Neuroscience*, *28*, 794-801.

Lewis, S. P., & Baker, T. G. (2011). The possible risks of self-injury web sites: A content analysis. *Archives of Suicide Research*, *15*, 390-396.

Lewis, S. P., Health, N. L., St. Denis, J. M., Noble, R. (2011). The scope of non-suicidal self-injury on YouTube. *Pediatrics, 127*, 2010–2317.

Levesque, C., Lafontaine, M. F., & Bureau, J. F. (2017). The mediating effects of emotion regulation and dyadic coping on the relationship between romantic attachment and non-suicidal self-injury. *Journal of Youth and Adolescence*, *46*, 277-287.

Levesque, C., Lafontaine, M. F., Bureau, J. F., Cloutier, P., & Dandurand, C. (2010). The influence of romantic attachment and intimate partner violence on non-suicidal self-injury in young adults. *Journal of Youth and Adolescence*, *39*, 474-483.

Linehan, M. M. (1993). *Cognitive-behavioral treatment of borderline personality disorder.* New York: The Guilford Press.

Lloyd-Richardson, E. E., Perrine, N., Dierker, L., & Kelley, M. L. (2007). Characteristics and functions of non-suicidal self-injury in a community sample of adolescents. *Psychological Medicine*, *37*, 1183-1192.

Lovallo, W. (1975). The cold pressor test and autonomic function: a review and integration. *Psychophysiology*, *12*, 268-282.

Martin, G., Swannell, S. V., Hazell, P. L., Harrison, J. E., & Taylor, A. W. (2010). Self-injury in Australia: A community survey. *Medical Journal of Australia, 193,* 506–510.

MacCallum, R. C., Widaman, K. F., Zhang, S., & Hong, S. (1999). Sample size in factor analysis. *Psychological Methods, 4,* 84.

McAllister, M., Creedy, D., Moyle, W., & Farrugia, C. (2002). Nurses' attitudes towards clients who self-harm. *Journal of Advanced Nursing, 40,* 578-586.

McCloskey, M. S., & Berman, M. E. (2003). Alcohol intoxication and self-aggressive behavior. *Journal of Abnormal Psychology*, *112*, 306 - 311

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*, 197-209.

McCoy, K., Fremouw, W., & McNeil, D. W. (2010). Thresholds and tolerance of physical pain among young adults who self-injure. *Pain Research & Management: The Journal of the Canadian Pain Society*, *15*, 371 – 377.

Muehlenkamp, J., Brausch, A., Quigley, K., & Whitlock, J. (2012). Interpersonal features and functions of nonsuicidal self-injury. *Suicide and Life-Threatening Behavior, 43,* 67-80.

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*, 1-9.

Muehlenkamp, J. J., Ertelt, T. W., Miller, A. L., & Claes, L. (2011). Borderline personality symptoms differentiate non-suicidal and suicidal self-injury in ethnically diverse adolescent outpatients. *Journal of Child Psychology and Psychiatry*, *52*, 148-155.

Muehlenkamp, J. J., & Gutierrez, P. M. (2007). Risk for suicide attempts among adolescents who engage in non-suicidal self-injury. *Archives of Suicide Research*, *11*, 69-82.

Muehlenkamp, J. J., Williams, K. L., Gutierrez, P. M. & Claes, L. (2009). Rates of non-suicidal self-injury in high school students across five years. *Archives of Suicide Research, 13,* 317-329.

Nock, M. K. (2009). Why do people hurt themselves?: New insights into the nature and functions of self-injury. *Current Directions in Psychological Science, 18*, 78-83.

Nock, M., & Banaji, M. (2007a). Assessment of self-injurious thoughts using a behavioral test. *American Journal of Psychiatry*, *164*, 820-823.

Nock, M. K., & Banaji, M. R. (2007b). Prediction of suicide ideation and attempts among adolescents using a brief performance-based test. *Journal of Consulting and Clinical Psychology*, *75*, 707-715.

Nock, M. K., Joiner, T. E., Gordon, K. H., Lloyd-Richardson, E., & Prinstein, M. J. (2006). Nonsuicidal self-injury among adolescents: Diagnostic correlates and relation to suicide attempts. *Psychiatry Research, 144,* 65–72.

Nock, M. K., & Mendes, W. B. (2008). Physiological arousal, distress tolerance, and social problem-solving deficits among adolescent self-injurers. *Journal of Consulting and Clinical Psychology*, *76*, 28–38.

Nock, M. K., & Prinstein, M. J. (2004). A functional approach to the assessment of self-mutilative behavior. *Journal of Consulting and Clinical Psychology*, *72*, 885-890.

Nock, M. K., & Prinstein, M. J. (2005). Contextual features and behavioral functions of self-mutilation among adolescents. *Journal of Abnormal Psychology*, *114*, 140-146.

Nock, M. K., Prinstein, M. J., & Sterba, S. K. (2008). Revealing the form and function of self-injurious thoughts and behaviors: A real-time ecological assessment study among adolescents and young adults. *Journal of Abnormal Psychology, 118,* 816-827.

O'Connor, B. P. (2000). SPSS and SAS programs for determining the number of components using parallel analysis and Velicer's MAP test. *Behavior Research Methods, Instrumentation, and Computers, 32,* 396-402.

Oldershaw, A., Richards, C., Simic, M., & Schmidt, U. (2008) Parents' perspectives on adolescent self-harm: Qualitative study. *British Journal of Psychiatry, 193,* 140–144.

Orchowski, L. M., & Gidycz, C. A. (2012). To whom do college women confide following sexual assault? A prospective study of predictors of sexual assault disclosure and social reactions. *Violence Against Women*, *18*, 264-288.

Osman, A., Bagge, C. L., Guitierrez, P. M., Konick, L. C., Kopper, B. A., & Barrios, F. X. (2001). The Suicidal Behaviors Questionnaire-Revised (SBQ-R): Validation with clinical and nonclinical. *Assessment, 8,* 443-454.

Pachankis, J. E. (2007). The psychological implications of concealing a stigma: A cognitive–affective– behavioral model. *Psychological Bulletin, 133,* 328-345.

Paul, E., Tsypes, A., Eidlitz, L., Ernhout, C., & Whitlock, J. (2015). Frequency and functions of non-suicidal self-injury: Associations with suicidal thoughts and behaviors. *Psychiatry Research*, *225*, 276-282.

Pennebaker, J. W., & Francis, M. E. (1996). Cognitive, emotional, and language processes in disclosure. *Cognition and Emotion, 10,* 601–626.

Pennebaker, J. W., Kiecolt-Glaser, J. K., & Glaser, R. (1988). Disclosure of traumas and immune function: health implications for psychotherapy. *Journal of Consulting and Clinical Psychology*, *56*, 239-245.

Plener, P. L., Bubalo, N., Fladung, A. K., Ludolph, A. G., & Lulé, D. (2012). Prone to excitement: Adolescent females with non-suicidal self-injury (NSSI) show altered cortical pattern to emotional and NSS-related material. *Psychiatry Research: Neuroimaging, 203*, 146-152.

Plener, P. L., Schumacher, T. S., Munz, L. M., & Groschwitz, R. C. (2015). The longitudinal course of non-suicidal self-injury and deliberate self-harm: A systematic review of the literature. *Borderline Personality Disorder and Emotion Dysregulation, 2:2.*

Preacher, K. J., & MacCallum, R. C. (2002). Exploratory factor analysis in behavior genetics research: Factor recovery with small sample sizes. *Behavior Genetics*, *32*, 153-161.

Primomo, J., Yates, B. C., & Woods, N. F. (1990). Social support for women during chronic illness: The relationship among sources and types to adjustment. *Research in Nursing & Health*, *13*, 153-161.

Robertson, C. D., Miskey, H., Mitchell, J., & Nelson-Gray, R. (2013). Variety of self-injury: Is the number of different methods of non-suicidal self-injury related to personality, psychopathology, or functions of self-injury?. *Archives of Suicide Research*, *17*, 33-40.

Rimé, B., Philippot, P., Boca, S., & Mesquita, B. (1992). Long-lasting cognitive and social consequences of emotion: Social sharing and rumination. In W. Stroebe & M. Hewstone (Eds.), *European Review of Social Psychology* (Vol. 3, pp. 225-258). Chichester: Wiley.

Ritsher, J. B., Otilingam, P. G., & Grajales, M. (2003). Internalized stigma of mental illness: Psychometric properties of a new measure. *Psychiatry Research, 121,* 31–49.

Russ, M. J., Campbell, S. S., Kakuma, T., Harrison, K., & Zanine, E. (1999). EEG theta activity and pain insensitivity in self-injurious borderline patients. *Psychiatry Research*, *89*, 201-214.

Russ, M. J., Roth, S. D., Kakuma, T., Harrison, K., & Hull, J. W. (1994). Pain perception in self-injurious borderline patients: naloxone effects. *Biological Psychiatry*, *35*, 207-209.

Russ, M. J., Roth, S. D., Lerman, A., Kakuma, T., Harrison, K., Shindledecker, R. D., ... & Mattis, S. (1992). Pain perception in self-injurious patients with borderline personality disorder. *Biological Psychiatry*, *32*, 501-511.

Sadler, T. G., Wieland, B. A., Mefferd, R. B., Benton, R. G., & McDaniel, C. D. (1967). Modification in autonomically mediated physiological responses to cold pressor by cognitive activity: An extension. *Psychophysiology*, *4*, 229-230.

Saunders, K. A., Hawton, K., Fortune, S., & Farrell, S. (2012). Attitudes and knowledge of clinical staff regarding people who self-harm: A systematic review. *Journal of Affective Disorders, 139,* 205–216.

Schmahl, C., & Bremner, J. D. (2006). Neuroimaging in borderline personality disorder. *Journal of Psychiatric Research*, *40*, 419-427.

Schoenleber, M., Berenbaum, H., & Motl, R. (2014). Shame-related functions of and motivations for self-injurious behavior. *Personality Disorders: Theory, Research, and Treatment*, *5*, 204-211.

Selby, E. A., Bender, T. W., Gordon, K. H., Nock, M. K., & Joiner Jr, T. E. (2011). Non-suicidal self-injury (NSSI) disorder: A preliminary study. *Personality Disorders: Theory, Research, and Treatment*, *3*, 167.

Shapiro, D. N., Chandler, J., & Mueller, P. A. (2013). Using Mechanical Turk to study clinical populations. *Clinical Psychological Science*, *1*, 213-220.

Silverman, M., Berman, A. L., Sanddal, N. D., O'Carroll, P. W., & Joiner, T. (2007). Rebuilding the Tower of Babel: A revised nomenclature for the study of suicide and suicidal behaviors: Part 2: Suicide-related ideations, communications, and behaviors. *Suicide and Life-Threatening Behavior, 37*, 264-277.

Simons, J. S., & Gaher, R. M. (2005). The Distress Tolerance Scale: Development and validation of a self-report measure. *Motivation and Emotion*, *29*, 83-102.

Sloan, P. A., Berman, M. E., Zeigler-Hill, V., & Bullock, J. (2009). Group influences on self-aggression: Conformity and dissenter effects. *Journal of Social and Clinical Psychology, 28,* 535-553.

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*, 1107-1121.

Soloff, P., Lis, J., Kelly, T., Cornelius, J., & Ulrich, R. (1994). Self-mutilation and suicidal behavior in borderline personality disorder. *Journal of Personality Disorders, 8,* 257–267.

Somer, O., Bildik, T., Kabukçu-Başay, B., Güngör, D., Başay, Ö., & Farmer, R. F. (2015). Prevalence of non-suicidal self-injury and distinct groups of self-injurers in a community sample of adolescents. *Social Psychiatry and Psychiatric Epidemiology*, *7,* 1163-1171.

Stam, H. J., Petrusic, W. M., & Spanos, N. P. (1981). Magnitude scales for cold pressor pain. *Perception & Psychophysics*, *29*, 612-617.

Starzynski, L. L., Ullman, S. E., Filipas, H. H., & Townsend, S. M. (2005). Correlates of women's sexual assault disclosure to informal and formal support sources. *Violence and Victims*, *20*, 417.

Steiger, J. H. (2007). Understanding the limitations of global fit assessment in structural equation modeling. *Personality and Individual Differences*, *42*, 893-898.

Sternback, R.A., Murphy, R.W., Timmermans, G., Greenhoot, J. H., & Akeson, W.H. (1974). *Measuring the severity of clinical pain.* In J. J. Bonica (Ed.) Advances in Neurology, Vol.4 International Symposium on Pain, Raven Press, New York, pp. 281-288

Swannell, S. V., Martin, G. E., Page, A., Hasking, P., & St John, N. J. (2014). Prevalence of nonsuicidal self-injury in nonclinical samples: Systematic review, meta-analysis and meta-regression. *Suicide and Life-Threatening Behavior*, *44*, 273-303.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using Multivariate Statistics*. Boston: Allyn and Bacon.

Taliaferro, L. A., & Muehlenkamp, J. J. (2015). Risk factors associated with self-injurious behavior among a national sample of undergraduate college students. *Journal of American College Health*, *63*, 40-48.

Tatnell, R., Kelada, L., Hasking, P., & Martin, G. (2014). Longitudinal analysis of adolescent NSSI: The role of intrapersonal and interpersonal factors. *Journal of Abnormal Child Psychology*, *42*, 885-896.

Taylor S. P. (1967). Aggressive behavior and physiological arousal as a function of provocation and the tendency to inhibit aggression. *Journal of Personality, 35*, 297–310.

Toste, J. R., & Heath, N. L. (2010). School response to non-suicidal self-injury. *The Prevention Researcher, 17,* 14-17.

Treynor, W., Gonzalez, R., & Nolen-Hoeksema, S. (2003). Rumination reconsidered: A psychometric analysis. *Cognitive Therapy and Research*, *27*, 247-259.

Turner, B. J., Austin, S. B., & Chapman, A. L. (2014). Treating nonsuicidal self-injury: A systematic review of psychological and pharmacological interventions. *The Canadian Journal of Psychiatry*, *59*, 576-585.

Ullman, S. E. (1996). Social reactions, coping strategies, and self-blame: Attributions in adjustment to sexual assault. *Psychology of Women Quarterly*, *20*, 505-526.

Ullman, S. E. (1996). Do social reactions to sexual assault victims vary by support provider?. *Violence and Victims*, *11*, 143-157.

Ullman, S. E. (1996). Correlates and consequences of adult sexual assault disclosure. *Journal of Interpersonal Violence*, *11*, 554-571.

Ullman, S. E. (2000). Psychometric characteristics of the social reactions questionnaire. *Psychology of Women Quarterly*, *24*, 257-271.

Ullman, S. E. (2007). Relationship to perpetrator, disclosure, social reactions, and PTSD symptoms in child sexual abuse survivors. *Journal of Child Sexual Abuse*, *16*, 19-36.

Ullman, S. E., & Peter-Hagene, L. (2014). Social reactions to sexual assault disclosure, coping, perceived control, and PTSD symptoms in sexual assault victims. *Journal of Community Psychology*, *42*, 495-508.

Ullman, S. E., & Siegel, J. M. (1995). Sexual assault, social reactions, and physical health. *Women's Health*, *1*, 289-308.

Waller, G., & Ruddock, A. (1993). Experiences of disclosure of childhood sexual abuse and psychopathology. *Child Abuse Review*, *2*, 185-195.

Weinberg, A., & Klonsky, E. D. (2012). The effects of self-injury on acute negative arousal: A laboratory simulation. *Motivation and Emotion*, *36*, 242-254.

Welch, S. S., Linehan, M. M., Sylvers, P., Chittams, J., & Rizvi, S. L. (2008). Emotional responses to self-injury imagery among adults with borderline personality disorder. *Journal of Consulting and Clinical Psychology*, *76*, 45 – 51.

Whitlock, J., Eckenrode, J., & Silverman, D. (2006). Self-injurious behaviors in a college population. *Pediatrics, 117,* 1939–1948

Whitlock, J., Muehlenkamp, J., & Eckenrode, J. (2008). Variation in nonsuicidal self-injury: Identification and features of latent classes in a college population of emerging adults. *Journal of Clinical Child & Adolescent Psychology*, *37*, 725-735.

Whitlock, J., Muehlenkamp, J., Eckenrode, J., Purington, A., Abrams, G. B., Barreira, P., & Kress, V. (2013). Nonsuicidal self-injury as a gateway to suicide in young adults. *Journal of Adolescent Health*, *52*, 486-492.

Worthington, R. L., & Whittaker, T. A. (2006). Scale development research: A content analysis and recommendations for best practices. *The Counseling Psychologist*, *34*, 806-838.

Wu, C. Y., Whitley, R., Stewart, R., & Liu, S. I. (2012). Pathways to care and help-seeking experience prior to self-harm: A qualitative study in Taiwan. *Journal of Nursing Research, 20,* 32–42.

Yong, A. G., & Pearce, S. (2013). A beginner's guide to factor analysis: Focusing on exploratory factor analysis. *Tutorials in Quantitative Methods for Psychology*, *9*, 79-94.

Zahn, R., Lythe, K. E., Gethin, J. A., Green, S., Deakin, J. F. W., Workman, C., & Moll, J. (2015). Negative emotions towards others are diminished in remitted major depression. *European Psychiatry*, *30*, 448-453.

Zimet, G. D., Dahlem, N. W., Zimet, S. G., & Farley, G. K. (1988). The multidimensional scale of perceived social support. *Journal of Personality Assessment*, *52*, 30-41.

APPENDIX

Self-Injury Social Reactions Questionnaire

The following is a list of behaviors that other people responding to a person with non-suicidal self-injury often show. Please indicate how often you experienced each of the listed responses from other people by selecting the appropriate number next to each item, where 0 = *never,* 1 = *rarely,* 2 = *sometimes,* 3 = *frequently,* 4 = *always.*

How other people responded…

Pulled away from you	0	1	2	3	4
Told you that you are just trying to get attention	0	1	2	3	4
Told others about your behavior without your permission	0	1	2	3	4
Distracted you with other things	0	1	2	3	4
Offered to help you get medical care	0	1	2	3	4
Made you promise to stop engaging in the behavior	0	1	2	3	4
Treated you differently in some way that made you uncomfortable	0	1	2	3	4
Tried to take control of what you did/decisions you made	0	1	2	3	4
Focused on his/her own needs and neglected yours	0	1	2	3	4
Told you to go on with your life	0	1	2	3	4
Encouraged you to seek counseling	0	1	2	3	4
Told you that you should feel ashamed because of your behavior	0	1	2	3	4
Avoided talking to you or spending time with you	0	1	2	3	4
Made decision or did things for you	0	1	2	3	4
Said they feel personally wronged by your behavior	0	1	2	3	4
Told you to stop thinking about it	0	1	2	3	4
Listened to your thoughts and feelings	0	1	2	3	4
Saw your side of things and did not make judgements	0	1	2	3	4
Told you that you could have done more to prevent your behavior	0	1	2	3	4
Acted as if you were "damaged goods" or somehow different now	0	1	2	3	4
Treated you as if you were a child or somehow incompetent	0	1	2	3	4
Expressed so much anger about your behavior that you had to calm them down	0	1	2	3	4

Told you to stop talking about it	0	1	2	3	4
Showed understanding of your experiences and feelings	0	1	2	3	4
Told you that you are just trying to manipulate others	0	1	2	3	4
Told you that you were acting irresponsibly	0	1	2	3	4
Minimized the importance or seriousness of your experience	0	1	2	3	4
Said he/she knew how you felt when he/she really did not	0	1	2	3	4
Got so upset that he/she needed reassurance from you	0	1	2	3	4
Tried to discourage you from thinking about your behavior	0	1	2	3	4
Was able to really accept your experience	0	1	2	3	4
Spent time with you	0	1	2	3	4
Told you that you did not do anything wrong	0	1	2	3	4
Made a joke or sarcastic comment about this type of experience	0	1	2	3	4
Made you feel like you didn't know how to take care of yourself	0	1	2	3	4
Said they feel you're tainted by your behavior	0	1	2	3	4
Encouraged you to keep your behavior a secret	0	1	2	3	4
Believed you were trying your best	0	1	2	3	4
Provided information and discussed options	0	1	2	3	4

When filling out the previous items, what disclosure interaction were you most thinking of? Check all that apply.

     My first disclosure
     My most recent disclosure
     My most positive disclosure
     My most negative disclosure
     A different disclosure

How helpful were these responses to you at that time?
1 (not at all helpful) – 5 (neither unhelpful nor helpful) – 10 (very helpful)

Would you disclose this behavior again in the future?
Yes / No