



## Is non-suicidal self-injury an “addiction”? A comparison of craving in substance use and non-suicidal self-injury

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### ABSTRACT

There is debate among researchers regarding the most appropriate conceptual model of non-suicidal self-injury (NSSI). Some argue that NSSI is best viewed within an addictions framework. Because craving of substances is a key concept in the addictions literature, we sought to compare the nature of craving in NSSI and substance use. Measures of NSSI, substance use, and craving were administered to a sample of adolescents ( $n = 58$ ) receiving psychiatric treatment. It was found that total craving scores were significantly lower for NSSI than for substances. Item-level analyses suggested that substances are craved in a variety of contexts, whereas NSSI is typically craved in the context of negative emotions. The pattern of results remained the same when analyses were limited to patients who engaged in both NSSI and substance use. Thus, findings appear to be due to differences in the nature of the behaviors themselves rather than to individual differences between those who engage in NSSI or use substances. We conclude that, while both behaviors have powerful reinforcement contingencies, NSSI appears to be almost exclusively maintained by negative reinforcement (e.g., the reduction of aversive emotions). Findings are more consistent with emotion regulation than addiction models of NSSI.

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### 1. Introduction

Non-suicidal self-injury (NSSI) is the intentional and direct injuring of one's own body without suicidal intent (ISSS, 2007). Lifetime prevalence of NSSI in the community varies from approximately 6% of adults (Klonsky, 2011) to 15–17% of adolescents and university students (Laye-Gindhu and Schonert-Reichl, 2005; Whitlock and Knox, 2007; Nixon et al., 2008), while rates among clinical populations range from 20% (adults; Briere and Gil, 1998) to over 60% (adolescents; DiClemente et al., 1991; Nock and Prinstein, 2004). Despite increased attention to NSSI in the empirical and clinical literature, consensus has not yet been reached about how to best conceptualize the behavior. Early research regarded NSSI as a symptom of borderline personality disorder (BPD; Schaffer et al., 1982; Dulit et al., 1994); consistent with this perspective, the Diagnostic and Statistical Manual (DSM-IV-TR; American Psychiatric Association, 2000) classifies NSSI as a symptom of BPD. Others have conceptualized NSSI as a disorder of impulse control (Favazza and Rosenthal, 1993; Herpertz et al., 1995; Herpertz et al., 1997). More recently, researchers have argued that converging evidence supports conceptualizing NSSI as a disorder of emotion dysregulation (Chapman et al., 2006; Klonsky, 2007; Gratz and Roemer, 2008; Klonsky, 2009).

In addition to the conceptualizations described above, NSSI has also been viewed as an addictive behavior. Early work described a wide range of self-harm behaviors as addictive because they were both “coercive” and “relieving” (Tantam and Whittaker, 1992, p. 462). Faye (1995) presented a theoretical rationale for conceptualizing NSSI as an addictive behavior; specifically, she suggested that the increase in negative emotions prior to NSSI is analogous to the aversive withdrawal symptoms experienced by drug users. She further noted that self-injurers and drug users share similar ages of onset and similar rates of histories of childhood abuse. Other authors have investigated addictive aspects of NSSI in phenomenological studies, using case reports from clients with BPD (Karwautz et al., 1996), as well as semi-structured interview assessments of emotional pathways to cutting (Huband and Tantam, 2004). Recent work suggests that individuals who engage in NSSI often experience strong urges to self-injure (Washburn et al., 2010). Additionally, some findings indicate that endogenous opioids may be reduced among individuals who engage in NSSI, particularly those with comorbid borderline personality disorder, suggesting that NSSI may be used by some to artificially stimulate the endogenous opioid system (Sher and Stanley, 2008; Bandelow et al., 2010; Stanley et al., 2010; but for evidence contradicting the opioid hypothesis of NSSI also see Russ et al., 1994; Sher and Stanley, 2009).

Despite the conceptual and qualitative accounts described above, only one study to date has investigated an addictions model of NSSI empirically (Nixon et al., 2002). Nixon and colleagues examined addictive qualities of NSSI in adolescent psychiatric patients who had engaged in repetitive NSSI in the previous 6 months. The study

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included a self-report measure of addictive aspects of NSSI based on the DSM-IV criteria for substance dependence. The measure assessed seven addictive criteria, such as loss of control over NSSI, increasing tolerance, and increased tension if NSSI was not performed. Examples of items include "SI [self-injury] continues despite recognizing it as harmful," "frequency and/or intensity has increased to achieve the same effect," and "tension level reoccurs if discontinue SI" (p. 1338). Consistent with an addiction model of NSSI, the authors found that all participants reported having urges to self-injure after a stressful event, and 79% reported almost daily urges to self-harm. Further, 98% of participants endorsed at least three of the addictive criteria, and 81% endorsed more than five criteria.

Whereas Nixon et al. (2002) provide intriguing evidence that NSSI exhibits features of addiction, we suggest an important manner in which NSSI and addictive behaviors may differ: the relative roles of positive and negative reinforcement in perpetuating the two behaviors. In substance disorders, positive reinforcement plays an important role in the motivation and perpetuation of substance use. That is, drugs produce positive emotions, and addiction results in part from the desire to continually produce these pleasurable experiences (Stewart et al., 1984). Recent neurobiological work indicates that drug addiction is due in part to the positive reinforcement associated with increasing extracellular dopamine levels in the brain (Kufahl et al., 2005; Ross and Peselow, 2009). Of course, negative reinforcement also plays a significant role in drug addiction; for example, substances may be used to alleviate negative mood states or to prevent negative physical or psychological experiences, such as withdrawal (Wise and Bozarth, 1987; McCarthy et al., 2010). However, it is the clear and important role of positive reinforcement that may distinguish addictive behaviors like substance use from NSSI, in that while both positive and negative reinforcement sustain substance use, only negative reinforcement perpetuates NSSI.

In contrast to the literature on substance use, extensive research suggests that NSSI is primarily maintained by negative reinforcement, and specifically the reduction of aversive negative emotional states (for reviews see Chapman et al., 2006; Klonsky, 2007; Nock, 2010). A study of adolescent self-injurers found that the most common emotions before NSSI were negative (overwhelmed, sad, hurt emotionally, frustrated), while the least common emotions were positive (relieved, euphoric, satisfied) (Klonsky, 2009). The same study found that the largest change in emotions from before to after engaging in NSSI involved states indicating the removal of negative emotions, such as relief, which was reported to increase by more than two standard deviations from before to after engaging in NSSI. In contrast, increases from before to after NSSI were negligible for positive emotional states such as euphoria and excitement. It is noteworthy that even in Nixon et al. (2002), which describes important similarities between NSSI and addictive behaviors, the most common motivation for NSSI reported by participants was "to cope with feelings of depression." We could find only one study that has directly compared the role of negative emotions for NSSI and substance use (Coid, 1993). In a sample of female inpatients with BPD, researchers found that NSSI was described as exclusively dependent on negative mood for 64% of participants compared to only 19% for substance abuse. The primary role in NSSI of negative reinforcement – of reducing aversive emotions – is highlighted in many other studies as well (Kemperman et al., 1997; Briere and Gil, 1998; Nock and Prinstein, 2004; Laye-Gindhu and Schonert-Reichl, 2005; Klonsky and Glenn, 2009).

Given evidence for both important similarities and differences between NSSI and addictive behaviors, the present study sought to compare NSSI and substance use on a key dimension of addiction relating to the nature of reinforcement: craving. The DSM-IV-TR (American Psychiatric Association, 2000) defines craving as "a strong, subjective drive to use the substance" (p. 192). While specific definitions and models of craving differ by theoretical orientation, a recent review by Skinner and Aubin (2010) suggested that craving can be defined as "a desire of any intensity to consume a substance.... Craving

generally sets in motion a strong motivation, akin to an obsession, to do what is thought necessary to relieve it" (p. 620). Craving plays a pivotal role in perpetuating addictive use of substances (Gawin and Kleber, 1986; Roberts and Koob, 1997).

Understanding the extent to which craving occurs in NSSI and manifests similarly to craving in substance use would help determine the relevance of addictions models for NSSI. Although our study design allows for the possibility that craving will manifest similarly in NSSI and substance use, we hypothesize an important difference. We expect craving in NSSI versus substance use to reflect the differing roles that positive and negative reinforcement play in the perpetuation of the two behaviors. In short, we expect that substances will be craved across a variety of situations and contexts, consistent with the roles of both positive and negative reinforcement in substance use (Grunberg, 1994; Koob and Le Moal, 2001). In contrast, we expect NSSI to be craved almost exclusively in the context of negative emotions, consistent with the emotion-regulation and negative reinforcement models of NSSI (Chapman et al., 2006; Klonsky, 2007). In order to assess these issues, we developed a psychometrically sound craving measure suitable for use with both NSSI and substance use, and administered the measure to adolescent psychiatric patients with histories of NSSI, substance use, or both.

## 2. Methods

### 2.1. Participants

Participants were adolescents ( $n = 58$ ) receiving treatment at a psychiatric hospital in Suffolk County, NY between February 2008 and February 2009. All participants were recruited from either the inpatient ( $n = 50$ ) or the partial hospitalization ( $n = 8$ ) program at the hospital. Participants were recruited as part of a larger study investigating the functions of NSSI, during which the measures described below were administered. Participants from the larger study were included in these analyses if they reported a history of NSSI, of alcohol and/or drug use, or both on the craving measures described below. The presence of lifetime NSSI was confirmed by self-report on the Inventory of Statements about Self-Injury (ISAS; Klonsky and Olino, 2008; Klonsky and Glenn, 2009; more information on this measure is provided below). Participation in the study was voluntary, and neither costs nor rewards were associated with participation in the study. Ethics approval was obtained from the review boards at all participating institutions.

### 2.2. Measures

#### 2.2.1. Craving in NSSI and substance use

Because no measure had been developed to assess craving in NSSI, two parallel self-report measures of craving were developed for the purposes of this study: one for NSSI and one for substance use. We refer to these two questionnaires as the Self-Injury Craving Questionnaire (SICQ) and the Substance Use Craving Questionnaire (SUCQ) (reliability analyses for both questionnaires are reported below). Some of the questionnaire items were taken from the Cocaine Craving Questionnaire (CCQ; Tiffany et al., 1993), a reliable and valid measure of craving among cocaine users. The SICQ and the SUCQ are identical except that SICQ items refer to NSSI, while SUCQ items refer to substance use. Sample items include: "I often spend time making plans about when I can use the drug/self-injure next," "There are days when my desire to use drugs/self-injure is all I can think about," and "It would be easy to pass up the chance to use the drug/self-injure even when given the opportunity to" (reverse coded); a full list of items can be found in Table 3. Items are scored on the following scale: 0 (strongly disagree), 1 (disagree), 2 (neither agree nor disagree), 3 (agree), and 4 (strongly agree).

In addition, each version of the questionnaire contains an initial item asking the participant to identify his or her primary method of NSSI/substance use. The item for the SUCQ is, "If you have ever used drugs frequently, please write the drug used most often on the line below (e.g. alcohol, marijuana, cocaine, heroin)". The item for the SICQ is, "If you have ever self-injured frequently, please write the behavior you have performed most often on the line below (e.g. cutting, hitting, burning). For this page, we are only interested in non-suicidal self-injury (i.e. injuries done on purpose without suicidal intent)."

Development of the SICQ and SUCQ involved writing 10-item versions of the scales and then adjusting the measures based on reliability analyses. That is, Cronbach's alphas were obtained on each of the initial 10-item versions of the questionnaires, and items that reduced alpha were removed. This procedure resulted in two internally consistent seven-item measures (Cronbach's alphas of 0.83 and 0.83, respectively). Item-total correlations ranged from 0.31 to 0.73 for the SICQ and from 0.19 to 0.84 for the SUCQ. Total SICQ and SUCQ scores were calculated by summing participants' ratings for each of the seven items. One of the items was reverse-coded.

### 2.2.2. Psychiatric symptoms

In order to assess psychiatric symptoms and substance use, participants were administered the Patient Health Questionnaire for Adolescents (PHQ-A; Spitzer et al., 1999). The PHQ-A is an 83-item self-report measure that assesses a variety of current DSM-IV-TR diagnoses for children, including mood, anxiety, eating, and substance use disorders. The PHQ-A also asks about drug use in the last 6 months, including frequency, types of drugs used, and consequences of use. The PHQ-A has demonstrated good sensitivity, specificity, and diagnostic agreement (Johnson et al., 2002).

### 2.2.3. NSSI

In order to assess NSSI history, participants completed the Inventory of Statements about Self-Injury (ISAS; Klonsky and Olino, 2008; Klonsky and Glenn, 2009). The ISAS assesses lifetime frequency of 12 NSSI behaviors (e.g., cutting, burning, banging/hitting body parts). The ISAS also includes assessment of 13 functions of NSSI, but these scales were not utilized in the present study. Previous research supports the reliability and validity of the ISAS behavioral scales (Klonsky and Olino, 2008; Glenn and Klonsky, 2011).

### 2.3. Procedures

Upon admission into the inpatient or partial hospitalization program, hospital personnel informed potential participants and their legal guardians about the study. Consent was obtained from legal guardians, and assent was obtained from eligible participants. Participants completed the self-report measures individually to ensure privacy and confidentiality.

## 3. Results

### 3.1. Demographic and clinical characteristics

Forty-one (71%) of the participants were female, and the mean age for the full sample was 15.09 (S.D. = 1.32). Caucasians made up 63.8% of the sample, while 8.6% were African-American, 1.7% were Asian, 1.7% were Native American, 17.2% listed their ethnicity as "Other", and 6.9% declined to list an ethnicity; 20% were Hispanic. Twenty-nine percent of participants endorsed NSSI only, 17% alcohol/drug use only, and 53% of participants endorsed both NSSI and alcohol/drug use.

Participants had a mean of 2.08 (S.D. = 1.93) current Axis I diagnoses assessed by self-report on the PHQ-A. Drug abuse or dependence criteria were met by 28% of the sample, while alcohol abuse or dependence criteria were met by 24% of the sample. The most common diagnosis was major depressive disorder (31%). Additional prevalent diagnoses included generalized anxiety disorder (27%), dysthymic disorder (20%), and eating disorders not otherwise specified (19%). For more information on diagnostic rates in this sample, see Table 1.

The substances most commonly used by participants in the sample were marijuana and alcohol, with 61% of the full sample reporting use of each substance in the last 6 months. Participants also reported use of hallucinogens (17%), cocaine (13%), inhalants (11%), and other drugs (35%). The mean number of substances used in the last 6 months, as reported on the PHQ-A, was 1.93 (S.D. = 1.64). Consistent with the frequency of recent marijuana use, among those completing the SUCQ, most (73%) reported marijuana as their primary or most frequently used drug.

**Table 1**  
Diagnostic characteristics ( $n=58$ ).

Diagnosis	Percentage (N)
Major depressive disorder	31% (15)
Drug abuse/dependence	28% (13)
Generalized anxiety disorder	27% (9)
Alcohol abuse/dependence	24% (11)
Dysthymia	20% (10)
Eating disorder not otherwise specified	19% (8)
Panic disorder	8% (4)
Minor depressive disorder	6% (3)
Nicotine dependence	2% (1)
Anorexia nervosa	2% (1)
Bulimia nervosa	2% (1)

Regarding NSSI, the most prevalent behavior was cutting, which was reported by 64% of the full sample. The mean number of methods used for NSSI was 3 (S.D. = 2.70), and a majority (69%) endorsed using more than one method. The average duration of NSSI among participants was 1.70 years (S.D. = 1.71). Among those completing the SICQ, the most commonly reported method of NSSI was cutting (78%). Additional information on NSSI methods is presented in Table 2.

### 3.2. Craving of NSSI and substances

We next compared craving scores for all participants engaging in NSSI ( $n=46$ ) and all participants engaging in substance use ( $n=40$ ) (some participants contributed scores for both NSSI and substance use). Across all participants endorsing NSSI and/or substance use, mean craving scores were significantly lower for NSSI ( $M=7.22$ , S.D. = 6.05) than substances ( $M=14.13$ , S.D. = 7.09),  $t(84)=4.88$ ,  $p<0.001$ ,  $d=1.05$ . In order to investigate whether this difference could be attributed to the nature of the behaviors (i.e., NSSI versus substance use) as opposed to differences among individuals (i.e., adolescents who engage in NSSI versus adolescents who engage in substance use), we next analyzed only the subset of participants who engaged in both NSSI and substance use. Among this subsample, a paired samples  $t$ -test indicated that mean craving scores for NSSI ( $M=6.61$ , S.D. = 6.47) remained significantly lower than mean craving scores for substances ( $M=14.50$ , S.D. = 6.52),  $t(27)=4.68$ ,  $p<0.001$ ,  $d=1.22$ .

### 3.3. Item-level craving analyses

Because this is the first study to examine craving in NSSI, we also conducted item-level analyses of each craving measure in the full sample to explore the particular ways in which craving most differs for NSSI and substance use. Consistent with the mean differences reported above, all but one of the seven items used in the total score had significantly lower mean scores for NSSI than substance use (all  $p<0.05$ ; see Table 3). The two largest mean differences between parallel SICQ and SUCQ items were for item 4, "When I am in a good mood, I often want to use drugs/self-injure" ( $d=1.46$ ), and item 1, "Regardless of whether I'm having a good day or a bad day, I would want to use drugs/self-injure" ( $d=1.27$ ). Consistent with the study hypothesis that NSSI (but not substance use) would be craved primarily in negative emotional contexts, both items received significantly higher endorsement for substance use than NSSI.

Item-level analyses were repeated using only the subset of participants engaging in both NSSI and substance use. For all but one (item 7) of the seven items, mean craving scores for NSSI were significantly lower than mean craving scores for substances (all  $p<0.02$ ). These differences were greatest for items 1 ( $d=1.78$ ) and 5 ( $d=1.47$ ).

**Table 2**  
Methods of NSSI ( $n=58$ ).

Variable	Percentage (N)
Cutting	64% (37)
Banging/hitting self	31% (18)
Burning	28% (16)
Carving	26% (15)
Pulling hair	26% (15)
Severe scratching	24% (14)
Interfering with wound healing	22% (13)
Swallowing dangerous substances	19% (11)
Biting	17% (10)
Pinching	17% (10)
Sticking self with needles	14% (8)
Rubbing skin against rough surface	9% (5)
Other method (e.g., stabbed self, threw self down stairs)	3% (2)
2 + Methods	69% (40)

**Table 3**

Item level differences in craving of NSSI and substances in the full sample (ordered from the largest to the smallest difference).

Items included in total scale	SUCQ	SICQ	Cohen's d
	M (S.D.)	M (S.D.)	
5. When I am in a good mood, I often want to (use drugs/self-injure).	2.07 (1.42)	0.46 (0.72)	1.46***
1. Regardless of whether I'm having a good day or a bad day, I would want to (use drugs/self-injure).	2.50 (1.36)	0.89 (1.18)	1.27***
4. I often spend time making plans about when I can (use drugs/self-injure) next.	1.80 (1.38)	0.67 (1.06)	0.93***
3. Just thinking about (using drugs/self-injury) makes me crave it.	1.90 (1.43)	0.93 (1.14)	0.76***
6. Even when things are going well, I have trouble controlling the urge to (use drugs/self-injure).	1.68 (1.40)	0.83 (1.18)	0.66**
2. There are days when my desire to (use drugs/self-injure) is all I can think about.	2.07 (1.54)	1.37 (1.60)	0.45*
7. It would be easy to pass up the chance to (use drugs/self-injure), even when I am able to. (reverse coded)	2.10 (1.48)	2.07 (1.54)	0.02

SUCQ=Substance Use Craving Questionnaire; SICQ=Self-Injury Craving Questionnaire.

\*  $p < 0.05$ .

\*\*  $p < 0.01$ .

\*\*\*  $p < 0.001$ .

#### 4. Discussion

The present study was designed to compare the nature of craving in NSSI and substance use, and thereby help clarify the similarities and differences between NSSI and addictive behaviors. Participants were 58 adolescents receiving inpatient or partial hospitalization treatment at a psychiatric hospital, and who had histories of NSSI, substance use, or both. There were two primary findings. First, craving was found to be significantly stronger for substances than for NSSI, suggesting that the construct of craving may be more central for substance use than for NSSI. Second, NSSI appears to be craved almost exclusively in the context of negative emotions, whereas substances are craved across a wider variety of contexts. This pattern was observed both when comparing craving for individuals who have a history of either behavior, and when comparing craving for both NSSI and substances in individuals who engage in both behaviors. Therefore, the findings can be attributed to differences in the nature of the behaviors themselves, rather than to individual differences between adolescents who engage in NSSI and adolescents who engage in substance use.

Whereas previous work has noted similarities between NSSI and addictive behaviors (Nixon et al., 2002), the current findings highlight an important way in which these behaviors differ. Substances are craved across a variety of contexts, consistent with literature suggesting that substance use is maintained by both positive and negative reinforcement (Grunberg, 1994; Koob and Le Moal, 2001). In contrast, NSSI is primarily craved in the context of negative emotions, consistent with literature suggesting that NSSI is perpetuated primarily through negative reinforcement (i.e., the removal of aversive negative emotions; Klonsky, 2009). Taken together with previous research, results suggest that emotion regulation models of NSSI (Chapman et al., 2006; Klonsky, 2007) may more accurately and parsimoniously characterize NSSI as compared to addiction models.

One way to regard the difference between NSSI and substance use regards the pleasure-inducing (positively reinforcing) qualities of each behavior. If a behavior is pleasurable, it can be performed for either positive or negative reinforcement purposes. For example, a pleasurable food item such as ice cream can be eaten for enjoyment (i.e., positive reinforcement), or can be eaten when feeling bad as a way to feel better (i.e., negative reinforcement). In contrast, if a behavior is not inherently pleasurable, and instead only serves to reduce certain negative sensations when they occur, it will only be performed in limited contexts, when removal of negative sensations is desired. For example, pain-relieving medications are quite reinforcing via their reduction of pain, but will rarely if ever be utilized in the absence of physical pain. We believe substance use and NSSI behaviors fit a similar pattern. Substance use is rewarding in-and-of-itself, and hence occurs in response to positive affect (e.g., "let's celebrate by getting a drink") and in response to negative affect (e.g., "I need to escape from my sorrows"). NSSI, on the other hand, is not positively reinforcing, and is unlikely to be craved and/or be utilized in contexts other than aversive affect.

Several study limitations should be noted. Because this sample was composed of adolescents in inpatient and partial-hospitalization programs, future research should examine whether findings generalize to community samples of adolescents and to adults. It is important to examine generalizability of findings across individuals who vary in age and duration of NSSI, as research suggests that urges to engage in NSSI increase with age (Washburn et al., 2010). Additionally, because a previously validated measure of craving in NSSI did not exist, we had to develop parallel measures of drug/alcohol and NSSI craving for use in this sample. Although the measures demonstrated good internal consistency in our sample, the reliability and validity of the measures have not been well-established. Since the data collection for this study, a measure of urges to engage in NSSI has been developed and validated (ABUSI; Washburn et al., 2010); future research could incorporate both this scale and the SICQ (which has a greater emphasis on the context in which urges occur) to further investigate the relationship between intensity, frequency, and duration of urges to engage in NSSI and the contextual factors that influence NSSI craving. Finally, some of the important differences identified between craving in NSSI and drug use were based on item-level analyses. Individual items are less reliable than multi-item measures; thus, future research should continue to investigate differences in the 'addictive' natures of NSSI and substance use using more comprehensive and better-validated measures of craving and related constructs.

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