

AKADÉMIAI KIADÓ

Getting “clean” from nonsuicidal self-injury: Experiences of addiction on the subreddit r/selfharm

Journal of Behavioral
Addictions

DOI:
10.1556/2006.2022.00005
© 2022 The Author(s)

MCKENZIE HIMELEIN-WACHOWIAK¹ ,
SALVATORE GIORGI^{1,2} , AMY KWARTENG¹,
DESTINY SCHRIEFER¹, CHASE SMITTERBERG¹ ,
KENNA YADETA¹, ELISE BRAGARD^{1,3} ,
AMANDA DEVOTO¹ , LYLE UNGAR² , and
BRENDA CURTIS^{1*} 

¹ National Institute on Drug Abuse Intramural Research Program, Baltimore, MD, USA

² Department of Computer and Information Sciences, University of Pennsylvania, Philadelphia, PA, USA

³ Department of Psychology, Fordham University, Bronx, NY, USA

Received: September 16, 2021 • Revised manuscript received: January 21, 2022 • Accepted: February 27, 2022

FULL-LENGTH REPORT



ABSTRACT

Background & Aims: Previous studies have shown that nonsuicidal self-injury (NSSI) has addictive features, and an addiction model of NSSI has been considered. Addictive features have been associated with severity of NSSI and adverse psychological experiences. Yet, there is debate over the extent to which NSSI and substance use disorders (SUDs) are similar experientially. *Methods:* To evaluate the extent that people who self-injure experience NSSI like an addiction, we coded the posts of users of the subreddit r/selfharm ($n = 500$) for each of 11 DSM-5 SUD criteria adapted to NSSI. *Results:* A majority (76.8%) of users endorsed at least two adapted SUD criteria in their posts, indicative of mild, moderate, or severe addiction. The most frequently endorsed criteria were urges or cravings (67.6%), escalating severity or tolerance (46.7%), and NSSI that is particularly hazardous. User-level addictive features positively predicted number of methods used for NSSI, number of psychiatric disorders, and particularly hazardous NSSI, but not suicidality. We also observed frequent use of language and concepts common in SUD recovery circles like Alcoholics Anonymous. *Discussion & Conclusion:* Our findings support previous work describing the addiction potential of NSSI and associating addictive features with clinical severity. These results suggest that NSSI and SUD may share experiential similarities, which has implications for the treatment of NSSI. We also contribute to a growing body of work that uses social media as a window into the subjective experiences of stigmatized populations.

KEYWORDS

self-harm, self-injury, addiction, language, reddit, social media

INTRODUCTION

Nonsuicidal self-injury (NSSI), or the deliberate harming of one's body tissue without intending to die, and for reasons that are not socially sanctioned (International Society for the Study of Self-injury, 2018), has been identified in the Diagnostic and Statistical Manual of Mental Disorders 5 (DSM-5) as a target for future research (American Psychiatric Association, 2013). A meta-analysis has estimated lifetime prevalence of NSSI to be 5.5% among adults, 13.4% among young adults, and 17.2% among adolescents (Swannell, Martin, Page, Hasking, & St John, 2014), though more recent studies suggest an upward trend in prevalence

*Corresponding author. Biomedical
Research Center, 251 Bayview Blvd.
Suite 200, Baltimore, MD 21224,
USA. Tel.: + 443-740-2126.
E-mail: brenda.curtis@nih.gov



(Griffin et al., 2018; Wester, Trepal, & King, 2018). Criteria for NSSI Disorder (NSSI-D) have been outlined in the DSM-5, with potential motivations for self-injury being listed as (1) to obtain relief from a negative feeling state, (2) to resolve an interpersonal difficulty, and/or (3) to induce a positive feeling state (APA, 2013).

The affect-regulation model of NSSI (Klonsky, 2007) and the experiential avoidance model (EAM, Chapman, Gratz, & Brown, 2006) both support the first – and most common – of these motivations (Nock & Prinstein, 2004). In these models, NSSI is negatively reinforced due to its ability to either regulate negative affect or provide an escape from it, respectively. However, alternative models view NSSI through an addiction framework (see Blasco-Fontecilla et al., 2016). For example, the feelings of anxiety, tension, and agitation that often occurs before episodes of NSSI have been likened to the withdrawal symptoms experienced by people with substance use disorders (SUDs) (Faye, 1995). People who engage in NSSI also experience cravings and urges, a DSM-5 symptom of SUDs (APA, 2013; Nixon, Cloutier, & Aggarwal, 2002; Washburn, Juzwin, Styer, & Aldridge, 2010; Victor, Glenn, & Klonsky, 2012). Though SUDs are by definition psychiatric disorders, substance use alone can be considered a transdiagnostic behavior like NSSI (Bentley, Cassiello-Robbins, Vittorio, Sauer-Zavala, & Barlow, 2015; Eaton, Rodriguez-Seijas, Carragher, & Krueger, 2015).

So-called addictive features (used interchangeably here with addiction symptoms) of NSSI have been described in research by adapting DSM-IV-TR substance dependence criteria to NSSI (APA, 2000; Nixon et al., 2002). The Ottawa Self-Injury Inventory (Cloutier & Nixon, 2003; Nixon, Levesque, Preyde, Vanderkooy, & Cloutier, 2015) has an addictive features subscale that includes items such as “since you started to self-injure, the behavior occurs more often than intended” or “despite a desire to cut down or control this behavior, you are unable to do so,” corresponding to symptoms of SUD (see Martin et al., 2013). In one study, 97.6% of participants endorsed three or more of these addictive features. Greater endorsement of addictive features has been associated with frequency and severity of NSSI (Guérin-Marion, Martin, Deneault, Lafontaine, & Bureau, 2018; Nixon et al., 2002), accidentally harming oneself more than intended (Buser, Buser, & Rutt, 2017), distress over urges to self-injure (Guérin-Marion et al., 2018), internalized anger (Nixon et al., 2002), and suicidal thoughts (Csorba, Dinya, Plener, Nagy, & Páli, 2009).

Though evidence suggests addictive features of NSSI are common and potentially severe, there are still experiential differences between NSSI and SUDs. Though individuals with a history of both NSSI and SUD report experiencing craving for both behaviors, these individuals tend to have stronger craving for substances (Victor et al., 2012). In this study, craving for substances was also experienced in response to both positive and negative emotions, whereas craving for NSSI was typically only in response to negative emotions. The authors’ interpreted their results as lending greater support for an affect-regulation model of NSSI than an addiction one.

In recent years, social media has provided a method for exploring subjective experiences of NSSI – including addiction-type experiences – on a large scale. While NSSI is still highly stigmatized, online spaces exist where people who engage in NSSI share their experiences with NSSI and comorbid mental disorders and offer support and advice to their peers. These online spaces have been studied using methods like qualitative analyses of posts on NSSI-related message boards (Rodham, Gavin, & Miles, 2007; Whitlock, Powers, & Eckenrode, 2006) and cross-sectional surveys of internet use in young people who engage in NSSI (Harris & Roberts, 2013; Johnson, Zastawny, & Kulpa, 2010; Murray & Fox, 2006).

Addiction language and concepts (e.g., reporting days free from NSSI, expressing difficulty stopping, likening to drugs, etc.) indeed emerge from this type of research. Addiction themes have been observed in 3.4–41.7% of posts to NSSI message boards, (Whitlock et al., 2006), 10.8% of posts to NSSI groups on Facebook (Niwa & Mandrusiak, 2012), and many NSSI-related messages sent from teens to health professionals (Harvey & Brown, 2012). Posters would frequently solicit help for their “addiction” to NSSI or celebrate anniversaries or lengths of time free from NSSI, much like individuals in recovery from SUD. However, these communities have been referred to as a “double-edged sword” due to their potential to encourage, rather than discourage, NSSI (Lewis & Seko, 2015; Murray & Fox, 2006).

To our knowledge, there is only one social media study for which addictive features of NSSI were the primary focus. Davis and Lewis (2019) sampled 614 posts from four different NSSI-related message boards that expressed themes of addiction, of which 500 met diagnostic criteria for behavioral addiction. The authors concluded that NSSI has addictive aspects but did not go so far as to say that it should be considered a behavioral addiction.

The present study

The present study expands upon the work of Davis & Lewis by using a large, diverse dataset consisting of posts to the social media platform Reddit. Reddit is unique in that it (1) is largely public, so one does not need an account to view content, (2) offers its users relative anonymity, as minimal identifying information is attached to any one user; and (3) is organized into hundreds of thousands of “subreddits,” or forums dedicated to specific topics. One subreddit, with over 73,000 members in 2021, is r/selfharm, which describes itself as “a subreddit for self-harmers to relate to each other, ask questions, and build up a community.”

In browsing r/selfharm, we observed language used in the SUD recovery circles Alcoholics Anonymous (AA) and Narcotics Anonymous (NA), such as words like “clean,” “relapse,” or “recovery,” or concepts such as the celebration of time without self-injuring. The aims of the current study were to (1) characterize and quantify this “addiction language” on r/selfharm, and (2) describe the extent to which users experience NSSI as an addiction. To accomplish these aims, posts from r/selfharm were coded for addiction



language and endorsement of symptoms of addiction, operationalized using DSM-5 SUD criteria adapted to NSSI.

Given the relationship between addictive features of NSSI and higher frequency and severity of self-injurious acts, as well as adverse psychological experiences, we also tested the user-level relationships between professed symptoms of addiction and (1) number of psychiatric disorders, (2) suicidal thoughts or behaviors, and (3) number of methods (cutting, burning, scratching, etc.) used to self-injure, an indicator of NSSI severity (Ammerman, Jacobucci, Turner, Dixon-Gordon, & McCloskey, 2020) and a risk factor for suicide attempt (Victor & Klonsky, 2014).

METHODS

Data

We used the Pushshift Reddit Dataset (Baumgartner, Zannettou, Keegan, Squire, & Blackburn, 2020) for the historical data necessary for this project. This dataset includes both original posts as well as comments (i.e., replies) on the original posts. Our data consisted of 69,380 original posts and 290,524 comments from 38,484 users on r/selfharm, spanning from its creation in March 2010 to December 2019.

Coding

Coding was completed in the qualitative analysis software MAXQDA (VERBI Software, 2019). Six coders (led by the first author) were instructed to code the subsetted post histories of selected r/selfharm users for each of 11 DSM-5 SUD criteria adapted to NSSI (APA, 2013; see Appendix Table A1); method of NSSI; psychiatric disorders disclosed; and the presence of suicidal thoughts or behaviors. Each post was coded by three different coders.

Following a pilot coding task identical to the one described, it was decided that (1) original posts be prioritized over comments, given they contained more personal details about the author, (2) coding be performed on a set number of words, as opposed to a set number of posts which vary in length, and (3) coding be limited to 2,000 words per user to improve feasibility and minimize coder fatigue. The final coding was performed on 500 random users who posted at least 2,000 words across at least 10 posts in r/selfharm. To create the subsetted post histories for coding, original posts were randomly selected until the 2,000-word threshold was met. If the user did not have enough words with original posts alone, then a random subset of the user's comments was also included.

Adapted DSM-5 SUD criteria. We faced challenges with the criteria referring to 1) recurrent substance use/NSSI in situations where it is physically hazardous, and 2) recurrent substance use/NSSI despite knowledge of its leading to negative physical or psychological effects. By definition, NSSI is physically damaging, whereas substance use may not be. To avoid coding every instance of NSSI as meeting these two criteria, we defined "physically hazardous" as dangerous beyond what is inherent to NSSI, such as injuries requiring

medical attention (e.g., stitches), causing infection or complications from blood loss, or resulting in permanent scarring. For the same reason, we focused on the *psychological* aspect of the second criterion. A person exhibiting this symptom would report that NSSI exacerbated an existing mental health problem or caused them feelings of guilt, shame, or regret.

In the case of disagreements between coders, consensus was reached by two-thirds majority vote such that a user was thought to "have" an addiction symptom if two or more coders selected it. The symptoms were summed by user to create addiction severity categories according to DSM-5 SUD guidelines (APA, 2013). Users with two or three symptoms were defined as having "mild" NSSI addiction, those with four or five were defined as having "moderate" NSSI addiction, and those with six or more were defined as having "severe" NSSI addiction.

NSSI, psychiatric disorders, and suicidality. We coded for method of NSSI (cutting, burning, scratching, etc.), psychiatric disorders disclosed (depression, anxiety, eating disorders, etc.), and the presence of suicidal thoughts or behaviors. A priori codes for methods were "cutting," "burning," "scratching," "hitting," "biting," and "other." If two or more coders selected "other" for a user, the specific method was recoded. "Other" forms of NSSI used by $\geq 1\%$ of users ($n = 5$) were counted, such that the resulting codes also included "starving," "purging," "choking," and "overdose."

For a user to "have" a psychiatric disorder, they had to explicitly disclose so in their posts (e.g., "I have Borderline Personality Disorder") or allude to it (e.g., "I've been super depressed lately"). This is a more liberal definition than clinicians use to diagnose their patients, as we did not use formal criteria. However, we also did not attempt to "diagnose" users based on reported symptoms and we were necessarily limited to analyzing the content users chose to discuss, so we doubt this method overestimated the prevalence of psychiatric disorders. A priori codes for psychiatric disorders were "anxiety/panic attacks," "depression," "bipolar disorder," "obsessive-compulsive disorder," "borderline personality disorder," "PTSD/trauma," and "other." "Other" disorders were recoded and counted in the same manner as "other" methods, such that the final codes also included "eating disorder," "autism spectrum disorder," "SUD," "schizophrenia/psychotic disorder," and "picking disorder." The cases of picking and eating disorders presented some ambiguity, as the associated behaviors may be a symptom of a psychiatric disorder or a method for NSSI. Coders were instructed to use context to determine to the best of their abilities the underlying cause of these behaviors.

Suicidality was coded as a "yes" (vs. "no") if a user mentioned thoughts of wanting to kill themselves or having attempted suicide in the past. Disagreements were resolved with a two-thirds majority vote. Methods and psychiatric disorders were summed by user. These totals and suicidality (Y/N) were used as outcomes in the statistical analyses.

Addiction language. Words associated with addiction or prevalent in SUD recovery circles were identified through:



a) preliminary browsing of NSSI subreddits, b) consultation of resources from AA and NA, and c) discussion among authors, who are all addiction scientists. Resulting a priori codes for this “addiction language” were as follows: “clean,” “relapse,” “recovery,” “streak,” “addict” or “I’m an addict,” and the celebration of a temporal milestone without self-injuring (e.g., “two weeks clean today!”). We also coded a priori for mentions of NSSI as an addiction or addictive, as well as mentions of NSSI being euphoric or comparisons between NSSI and drugs. Disagreements were resolved with a two-thirds majority vote. The same word or phrase appearing multiple times in a user’s post history was only counted once; we were more interested in adoption of this language in general than frequency of its usage, especially given the differing nature of posts across users. Thus, a total score for addiction language was calculated by summing the number of *different* addiction words or concepts present in a user’s posts.

Statistical analysis

Fleiss’s kappa (κ) (Fleiss, 1971; Fleiss, Levin, & Paik, 2013), a measure of intercoder reliability (ICR), was calculated for all a priori codes. Landis & Koch’s (1997) interpretations of κ were used. Linear regressions were used to test user-level relationships between addictive features and addiction language, number of methods used for NSSI, and number of psychiatric disorders. A logistic regression was used to test the relationships between addictive features and suicidality. Alpha was set to 0.05 for all statistical tests. Analyses were conducted in R using the *stats* package. Analyses were pre-registered and are available at <https://osf.io/v73qe>.

We also performed an exploratory logistic regression to test whether addiction symptoms, excepting the “recurrent NSSI in situations in which it is physically hazardous” criterion, predicted endorsement of that criterion. Given that coders were

instructed to interpret this item as NSSI that requires medical attention, causes infection, and/or will leave permanent scarring, we thought it a useful indicator of clinical severity.

Ethics

Data from Reddit (as well as Twitter, and various online message boards) is public and accessible to researchers. As such, this study was classified as not involving human subjects and exempt from Institutional Review Board approval. However, there are still ethical concerns with using these data. At the forefront are issues of informed consent; while members of intimate communities like r/selfharm implicitly consent to have their experiences shared with other participants on the platform, they may not have consented to having their experiences analyzed in a research study.

Per recommendations from Proferes, Jones, Gilbert, Fiesler, and Zimmer (2021), we refrain from reporting usernames or illustrative quotes in this paper, as is often common in qualitative research, to prevent identification of specific r/selfharm users. While information associated with these users is often limited to their username, posts on other subreddits, and location, we wanted to afford our “participants” as much anonymity as possible.

RESULTS

Intercoder reliability (ICR)

Fleiss’ κ for each of the 11 adapted DSM-5 SUD criteria ranged from 0.16 (slight agreement) for the criterion “spending a lot of time preparing to [self-injure], [self-injuring], or recovering from the effects of [self-injuring]” to 0.62 (substantial agreement) for “urges or cravings to [self-injure]” (Table 1). κ for addiction language ranged from 0.25

Table 1. Descriptive statistics: Addiction symptoms

	<i>n</i>	%	κ	agreement
Addiction symptoms				
Urges; cravings	338	67.6	0.62	substantial
Escalating severity; tolerance	239	47.8	0.39	fair
Physically hazardous NSSI	191	38.2	0.62	substantial
Persistent efforts to quit/cut back	147	29.4	0.26	fair
NSSI causing interpersonal problems	137	29.4	0.36	fair
NSSI despite knowledge of psychological harm	137	27.4	0.26	fair
More often or severe than intended	92	27.4	0.48	moderate
Failure to fulfill role obligations	30	18.4	0.32	fair
Withdrawal	29	6	0.48	moderate
Spending a lot of time self-injuring	28	5.8	0.16	poor
Giving up social or recreational activities	25	5.6	0.43	moderate
Severity categories				
None (0-1 symptom)	116	23.2		
Mild (2-3 symptoms)	230	46		
Moderate (4-5 symptoms)	134	26.8		
Severe (6+ symptoms)	20	4		

NSSI-adapted DSM-5 SUD criteria (addiction symptoms; addictive features) in descending order of the number of r/selfharm users ($n = 500$) endorsing each criterion at least once in their posts. $\kappa =$ Fleiss’s kappa statistic, an indicator of intercoder reliability. Interpretation of κ (from Landis & Koch, 1977) is also reported. All values of κ were significantly better than chance agreement at the $P < 0.001$ level.



(fair agreement) for “I’m an addict” to 0.96 (almost perfect agreement) for “relapse” (see Table 2). κ for psychiatric disorders ranged from 0.57 (moderate agreement) for trauma/PTSD to 0.86 (almost perfect agreement) for obsessive-compulsive disorder (see Appendix Table A2). κ for methods of self-injury ranged from 0.21 (fair agreement) for cutting to 0.87 (almost perfect agreement) for burning (see Appendix Table A3).

Addiction symptoms

Frequencies for each of the 11 criteria are reported in Table 1. Overall, 76.8% of users ($n = 384$) endorsed ≥ 2 NSSI-adapted DSM-5 SUD criteria, indicative of addiction from a diagnostic standpoint. Of these 384 users, 230 (59.9%) would be considered to have a “mild” addiction (2-3 symptoms), 134 (34.9%) to have a “moderate” addiction (4-5 symptoms), and 20 (5.2%) to have a “severe” addiction (≥ 6 symptoms). The most endorsed symptoms were cravings/urges (67.6%, $n = 338$), escalating severity/tolerance (47.8%, $n = 239$), and NSSI that is physically hazardous (38.2%, $n = 191$).

Table 2. Descriptive statistics: Addiction language

Addiction language	<i>n</i>	%	κ	Agreement
“clean”	340	68	0.89	almost perfect
“relapse”	250	50	0.96	almost perfect
NSSI as an addiction	150	30	0.88	almost perfect
Celebration of time without self-injury	110	22	0.35	fair
“streak”	82	16.4	0.90	almost perfect
“recovery”	63	12.6	0.81	almost perfect
NSSI as euphoric; like a drug	36	7.2	0.47	moderate
“I’m an addict”	7	1.4	0.25	fair

Addiction language in descending order of the number of r/selfharm users ($n = 500$) using each word, phrase, or concept at least once in their posts. $\kappa =$ Fleiss’s kappa statistic, an indicator of intercoder reliability. Interpretation of κ (from Landis & Koch, 1977) is also reported. All values of κ were significantly better than chance agreement at the $P < 0.001$ level. Items shown are from an a priori codebook, and no additional instances of addiction language used by at least 1% of users ($n = 5$) were identified in the coding process.

Table 3. Statistical relationships: Linear regressions

Linear Regressions	β^1	95% CI	<i>t</i>	<i>P</i>	Adj <i>R</i> ²
Symptoms of addiction^a					0.05
Addiction language ^b	0.22	[0.14, 0.31]	5.09	<0.001***	
Methods for NSSI					0.01
Symptoms of addiction	0.10	[0.02, 0.19]	2.36	0.02*	
Psychiatric disorders					0.01
Symptoms of addiction	0.12	[0.03, 0.21]	2.72	<0.01**	

¹Coefficients (β) were standardized for easier interpretation.

^a Symptoms of addiction (here used interchangeably addictive features of NSSI) is defined as the number of NSSI-adapted DSM-5 SUD criteria (out of 11) endorsed by a user in their posts.

^b Addiction language is defined as the number of unique words, phrases, or concepts associated with SUD recovery written by a user in their posts.

Addiction language

Frequencies for the addiction language examined are reported in Table 2. 86% of users ($n = 430$) used ≥ 1 instance of addiction language. The most frequent was the word “clean” (68%, $n = 340$), followed by “relapse” (50%, $n = 250$) and descriptions of NSSI as an addiction (30%, $n = 150$).

Statistical analyses

Addiction language score positively correlated with number of addiction symptoms (Pearson’s $r = 0.22$ [0.14, 0.31], $P < 0.001$). Addiction symptoms were positively associated with the number of methods for NSSI (standardized $\beta = 0.10$ [0.02, 0.19], $t = 2.36$, $P = 0.02$) and the number of psychiatric disorders (standardized $\beta = 0.12$ [0.03, 0.21], $t = 2.72$, $P < 0.01$; see Table 3). Addiction symptoms were not associated with suicidality (OR = 1.07 [0.95, 1.21], $P = 0.26$; see Table 4).

After removing the “NSSI in situations where it is physically hazardous” criterion from the sum of a user’s addiction symptoms, the remaining sum of addiction symptoms was positively associated with endorsement of this item (OR = 1.37 [1.19, 1.57], $P < 0.001$; see Table 4).

DISCUSSION AND CONCLUSIONS

We found more than three-quarters of our sample of r/selfharm users met criteria for addiction based on NSSI-adapted symptoms and diagnostic guidelines. These findings bolster previous research identifying addictive features of NSSI (e.g., Martin et al., 2013; Nixon et al., 2002) and proposing an addiction model of NSSI (e.g., Blasco-Fontecilla et al., 2016; Faye, 1995).

Addiction symptoms were associated with two indicators of NSSI severity – number of methods for NSSI and NSSI that is particularly dangerous, often requiring medical attention – a result that aligns with previous research (Martin et al., 2013; Nixon et al., 2002). Addiction symptoms were also associated with the number of psychiatric disorders endorsed by a user.



Table 4. Statistical relationships: Logistic regressions

Logistic regressions	OR	95% CI	Z	P	Pseudo-R ²
Suicidality					0.00
Intercept	1.47	[1.01–2.14]	2.01	0.04*	
Symptoms of addiction ^a	1.07	[0.95–1.21]	1.12	0.26	
“Physically hazardous” item^b					0.05
Intercept	0.29	[0.19–0.42]	6.23	<0.001***	
Symptoms of addiction ^c	1.37	[1.19–1.57]	4.43	<0.001***	

^a Symptoms of addiction (here used interchangeably addictive features of NSSI) is defined as the number of NSSI-adapted DSM-5 SUD criteria (out of 11) endorsed by a user in their posts.

^b This item comes from the DSM-5 SUD criteria “recurrent substance use/NSSI in situations in which it is physically hazardous.” Coders were instructed to consider this NSSI-adapted criterion as NSSI that is particularly dangerous, requiring medical attention or resulting in permanent scarring.

^c The “physically hazardous” item was excluded from symptoms of addiction in this particular model such that number of symptoms was out of 10 (rather than 11).

These relationships were small, which could suggest there are key factors other than addictive features that contribute to NSSI severity. However, the observed effect sizes are similar to those for significant predictors of future engagement in NSSI, such as cognitive factors and current NSSI frequency (Andrews, Martin, Hasking, & Page, 2013; Glenn & Klonsky, 2011). A meta-analysis of risk factors for engagement in NSSI revealed evidence for internalizing symptoms, cluster b symptoms, and past NSSI history, but its authors ultimately suggest a need for identifying novel risk factors and testing complex interactions (Fox et al., 2015). As is thought to be the case with suicide (Huang, Ribeiro, & Franklin, 2020), prediction of NSSI severity may be complex – best characterized by multiple possible interactions of many variables each with a small effect.

Addictive features of NSSI could be a crucial target for treatment. Currently, there are few empirically supported psychological or pharmacological treatments for NSSI, and none with enough support to be considered evidence-based treatment (Turner, Austin, & Chapman, 2014). Dialectical behavior therapy (DBT) may be the most effective treatment for reducing NSSI (Elmaghraby, Nobari, & Cullen, 2019), although its efficacy is mixed, and studies are often limited to populations with BPD (Turner et al., 2014). Moreover, a systematic review of treatment options for adolescents with NSSI found that no therapies were more effective than treatment-as-usual, suggesting a need for improved therapies specific to adolescents (Gonzales & Bergstrom, 2013). Given the shortage of effective treatments for NSSI, clinicians treating people who self-injure may consider adapting skills taught in SUD treatment settings, especially those aimed at reducing cravings or urges.

Despite evidence for the addictive nature of NSSI, we do not necessarily endorse the conceptualization of NSSI as a behavioral addiction. The definition of behavioral addictions - including but not limited to gambling, food addiction, sex addiction, and internet or video game addiction - has been contested (Petry, Zajac, & Ginley, 2018). Though scientists have identified experiential similarities between substance use and potentially addictive behaviors (Lesieur & Blume, 1993; Potenza, 2006), often adapting DSM-IV/DSM-5 SUD

criteria to do so (e.g., Muele & Gearhardt, 2014; Warthan, Uchida, & Wagner, 2005), they have also faced criticism for “overpathologizing everyday life” (Billieux, Schimmenti, Khazaal, Maurage, & Heeren, 2015; Mihordin, 2012). Moreover, whether NSSI is a behavioral addiction is a debate at the conceptual level. Though previous studies, as well as our own, provide convincing evidence for the addiction potential of NSSI, the symptoms of addiction we document occur at the individual, subjective level. Addictive features of NSSI can be an important clinical target, and necessary to understanding the psychology of people who self-injure, with or without the categorization of NSSI as a behavioral addiction.

Addiction language

Our analyses revealed widespread use of language found in the SUD recovery circles AA and NA, most commonly the words “clean” and “relapse.” Though previous studies identified addiction themes on other online platforms discussing NSSI (Niwa & Mandrusiak, 2012; Whitlock et al., 2006), to our knowledge none have described this so-called addiction language.

Addiction language may function to counter the rampant stigma faced by people who self-injure. Given increased attention to the adverse effects of stigma on people with SUDs (Crapanzano, Hammarlund, Ahmad, Hunsinger, & Kullar, 2019) and calls to reduce the stigma surrounding addiction (Adams & Volkow, 2020), describing NSSI as an addiction may reduce public stigma, a phenomenon that has been suggested by patients with SUDs (Hammer et al., 2013).

This shared language may also facilitate social identification, an aspect of recovery capital shown to protect against self-stigma and negative emotions, even in online spaces (Bliuc, Doan, & Best, 2019). Identification with people in recovery from an SUD, even in an abstract sense, may help to clarify a path to recovery from NSSI. More so than NSSI, SUDs have a diverse set of strategies for treatment and a large community of people living in recovery, providing a positive model for people trying to recover from NSSI.



Qualitative research on reddit

Our study also contributes to a growing field using social media language to examine mental health. Reddit data has been used qualitatively to examine perspectives on vaping among people with mental illness (Sharma, Wigginton, Meurk, Ford, & Gartner, 2017), mental health concerns among people with rheumatoid arthritis (Park, Howren, Davidson, & De Vera, 2020), and experiences with intimacy in the postpartum period (Harrison, 2020), among numerous other examples. Reddit and other social media platforms can also be data sources for natural language processing (NLP) studies, which seek to use automated techniques to draw conclusions from large linguistic datasets (Jurafsky & Martin, 2009). Computerized text analysis tools such as the Linguistic Inquiry and Word Count (LIWC) (Pennebaker, Boyd, Jordan, & Blackburn, 2015) can be used to measure sentiment, psychological states, and thematic categories of social media posts. These tools have been used to describe types of social support on mental health subreddits (De Choudhury & De, 2014) and to distinguish Reddit users with schizophrenia from others (Zomick, Levitan, & Serper, 2019). Several NLP studies have attempted to predict suicide risk from Reddit users' posts (Alambo et al., 2019; Matero et al., 2019; Shing et al., 2018), which has applications for prioritizing and connecting to resources the people most at risk of attempting suicide. Future studies could use NLP to automatically identify r/selfharm users most at risk for severe NSSI or suicide based on the linguistic features of their posts.

Limitations

There are limitations to our study that may temper interpretation of our results. First, the use of Reddit as a data source meant that we had no direct interaction with our "participants" and were limited to the information they chose to disclose in their posts. It was not possible to collect demographic information, as would be expected with other research methods, which hinders our ability to discuss generalizability of our findings to other populations. For similar reasons, we also did not have an objective way of measuring NSSI severity, and instead chose to use the number of methods and endorsement of the "physically hazardous" criterion as an indicator of severity.

Though coding was based only on the content users chose to discuss, a user failing to mention a particular symptom of addiction or method for NSSI does not mean that those experiences were not true for them in "real life." For this reason, it is possible that we underestimated the prevalence of addiction symptoms or our outcome variables.

Another limitation to our results is that our ICR, as measured by the κ statistic, was often lower than ideal, especially in the judgment of specific symptoms of addiction. Limited access to information or reliability concerns may explain why we were unable to replicate the relationship between addictive severity of NSSI and suicidality (e.g., Csorba et al., 2009). However, psychiatric diagnosis,

analogous to the task required of the coders, also has only moderate interrater reliability (κ between 0.4 and 0.6) (Kraemer, Kupfer, Clarke, Narrow, & Regier, 2012). Higher κ 's (from 0.6 to 0.8) have been documented in SUD diagnoses, with more severe cases showing higher agreement (Denis, Gelernter, Hart, & Kranzler, 2015), but these are at the diagnostic level (i.e., whether or not a patient has an SUD), not the symptom level, which is a judgment that requires more specificity. Some researchers have even argued against the use of ICR statistics in qualitative coding (Stenbacka, 2001; Braun & Clarke, 2013), stating that it goes against the principles of qualitative research, which generally welcomes varying interpretations of the same text. In an ideal scenario, all differences between coders would be resolved by discussion, but the taxing and subjective nature of the task made such discussion overly burdensome, resulting in our decision to settle disagreements using a two-thirds majority vote.

Further complicating coding was the risk that reading distressing material could negatively affect the coders – a possibility discussed in other qualitative studies (Woodby, Williams, Wittich, & Burgio, 2011; Williamson et al., 2020) and mentioned by some coders in ours. Apart from being inherently unpleasant, negative mood is thought to impair concentration and attention (Ellis & Ashbrook, 1989; Meinhardt & Pekrun, 2003), possibly making the task more difficult. Future research involving the coding of sensitive and potentially distressing material would benefit from recommendations for minimizing coder distress.

CONCLUSION

This study analyzed the posts of a subset of users on the subreddit r/selfharm for symptoms of addiction adapted from the DSM-5 SUD diagnosis and found that a large majority of users met diagnostic criteria for addiction. The most endorsed symptoms of addiction were cravings or urges, escalating severity or tolerance, and NSSI in situations where it is physically hazardous. Additionally, a large majority of users employed words or concepts prevalent in SUD recovery circles, with the most common of these being "clean" and "relapse." This addiction language was positively correlated with symptoms of addiction, and symptoms of addiction positively predicted a user's number of psychiatric disorders, number of methods for NSSI, and engagement in NSSI that is particularly dangerous. Taken together, our findings lend support for the addictive nature of NSSI and the relationship between addictive features and indicators of clinical severity. Clinicians should monitor for symptoms of addiction to NSSI and may consider adapting strategies from SUD treatment to better support people who self-injure.

Funding sources: This work was funded by the National Institute on Drug Abuse, Intramural Research Program in Baltimore, MD.



Authors' contribution: **MHW:** conceptualization, data curation, formal analysis, investigation, methodology. **SG:** conceptualization, data curation, formal analysis, investigation, project administration, supervision. **AK, DS, KY, and EB:** data curation, formal analysis, investigation. **AD:** methodology, supervision. **LU:** conceptualization, methodology, supervision. **BC:** conceptualization, project administration, supervision, resources, funding acquisition. **All authors:** writing – original draft, writing – editing/review. All authors had full access to all data in the study, take responsibility for the integrity of the data and the accuracy of the data analysis, and have read and approved of this version of the manuscript.

Conflict of interest: The authors have no conflicts of interest to disclose.

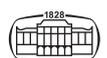
Acknowledgements: The authors would also like to acknowledge Dr. David H. Epstein and Jeffrey M. Rogers for their edits to the manuscript, as well as Lorenzo Leggio for his support of this project.

REFERENCES

- Adams, V. J. M., & Volkow, N. D. (2020). Ethical imperatives to overcome stigma against people with substance use disorders. *AMA Journal of Ethics*, 22(8), 702–708. <https://doi.org/10.1001/amajethics.2020.702>.
- Alambo, A., Gaur, M., Lokala, U., Kursuncu, U., Thirunarayan, K., Gyrard, A., . . . Pathak, J. (2019). Question answering for suicide risk assessment using reddit. *2019 IEEE 13th International Conference on Semantic Computing (ICSC)*, pp. 468–473. <https://doi.org/10.1109/ICOSC.2019.8665525>.
- American Psychiatric Association (2000). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: ext. rev.
- American Psychiatric Association (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). <https://doi.org/10.1176/appi.books.9780890425596>.
- Ammerman, B. A., Jacobucci, R., Turner, B. J., Dixon-Gordon, K. L., & McCloskey, M. S. (2020). Quantifying the importance of lifetime frequency versus number of methods in conceptualizing nonsuicidal self-injury severity. *Psychology of Violence*, 10(4), 442–451. <https://doi.org/10.1037/vio0000263>.
- Andrews, T., Martin, G., Hasking, P., & Page, A. (2013). Predictors of continuation and cessation of nonsuicidal self-injury. *Journal of Adolescent Health*, 53(1), 40–46. <https://doi.org/10.1016/j.jadohealth.2013.01.009>.
- Baumgartner, J., Zannettou, S., Keegan, B., Squire, M., & Blackburn, J. (2020). *The Pushshift Reddit dataset*. ArXiv:2001.08435 [Cs] <https://arxiv.org/abs/2001.08435>.
- Bentley, 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*, 37, 72–88. <https://doi.org/10.1016/j.cpr.2015.02.006>.
- Billieux, J., Schimmenti, A., Khazaal, Y., Maurage, P., & Heeren, A. (2015). Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research. *Journal of Behavioral Addictions*, 4(3), 119–123. <https://doi.org/10.1556/2006.4.2015.009>.
- Blasco-Fontecilla, H., Fernández-Fernández, R., Colino, L., Fajardo, L., Perteguer-Barrio, R., & De Leon, J. (2016). The addictive model of self-harming (non-suicidal and suicidal) behavior. *Frontiers in Psychiatry*, 7, 8.
- Bliuc, A.-M., Doan, T.-N., & Best, D. (2019). Sober social networks: The role of online support groups in recovery from alcohol addiction. *Journal of Community & Applied Social Psychology*, 29(2), 121–132. <https://doi.org/10.1002/casp.2388>.
- Braun, V., & Clarke, V. (2013). *Successful qualitative research: A practical guide for beginners*. SAGE.
- Buser, T. J., Buser, J. K., & Rutt, C. C. (2017). Predictors of unintentionally severe harm during nonsuicidal self-injury. *Journal of Counseling & Development*, 95(1), 14–23. <https://doi.org/10.1002/jcad.12113>.
- Chapman, A. L., Gratz, K. L., & Brown, M. Z. (2006). Solving the puzzle of deliberate self-harm: The experiential avoidance model. *Behaviour Research and Therapy*, 44(3), 371–394. <https://doi.org/10.1016/j.brat.2005.03.005>.
- Cloutier, P. F., & Nixon, M. K. (2003). *The Ottawa self-injury inventory: A preliminary evaluation*. Abstracts to the 12th international congress European society for child and adolescent psychiatry. *European Child and Adolescent Psychiatry*, 12(Suppl. 1), 1–94.
- Crapanzano, K. A., Hammarlund, R., Ahmad, B., Hunsinger, N., & Kullar, R. (2019). The association between perceived stigma and substance use disorder treatment outcomes: A review. *Substance Abuse and Rehabilitation*, 10, 1–12. <https://doi.org/10.2147/SAR.S183252>.
- Csorba, J., Dinya, E., Plener, P., Nagy, E., & Páli, E. (2009). Clinical diagnoses, characteristics of risk behaviour, differences between suicidal and non-suicidal subgroups of Hungarian adolescent outpatients practising self-injury. *European Child & Adolescent Psychiatry*, 18(5), 309–320. <https://doi.org/10.1007/s00787-008-0733-5>.
- Davis, S., & Lewis, C. A. (2019). Addiction to self-harm? The case of online postings on self-harm message boards. *International Journal of Mental Health and Addiction*, 17(4), 1020–1035. <https://doi.org/10.1007/s11469-018-9975-8>.
- De Choudhury, M., & De, S. (2014). Mental health discourse on Reddit: Self-disclosure, social support, and anonymity. *Eighth international AAAI Conference on Weblogs and social media (ICWSM)*. <https://www.aaai.org/ocs/index.php/ICWSM/ICWSM14/paper/viewFile/8075/8107>.
- Denis, C. M., Gelernter, J., Hart, A. B., & Kranzler, H. R. (2015). Inter-observer reliability of DSM-5 substance use disorders. *Drug and Alcohol Dependence*, 153, 229–235. <https://doi.org/10.1016/j.drugalcdep.2015.05.019>.
- Eaton, N. R., Rodriguez-Seijas, C., Carragher, N., & Krueger, R. F. (2015). Transdiagnostic factors of psychopathology and substance use disorders: A review. *Social Psychiatry and Psychiatric Epidemiology*, 50(2), 171–182.
- Ellis, H. C., & Ashbrook, P. W. (1989). The “state” of mood and memory research: A selective review. *Journal of Social Behavior and Personality*, 4(2), 1.



- Elmaghraby, R., Nobari, O., & Cullen, K. R. (2019). Treatment of non-suicidal self-injurious behavior in adolescents. *Psychiatric Times*, 36(11). <https://www.psychiatristimes.com/view/treatment-non-suicidal-self-injurious-behavior-adolescents>.
- Faye, P. (1995). Addictive characteristics of the behavior of self-mutilation. *Journal of Psychosocial Nursing and Mental Health Services*, 33(6), 36–39.
- Fleiss, J. L. (1971). Measuring nominal scale agreement among many raters. *Psychological Bulletin*, 76(5), 378. <https://doi.org/10.1037/h0031619>.
- Fleiss, J. L., Levin, B., & Paik, M. C. (2013). *Statistical methods for rates and proportions*. John Wiley & Sons.
- Fox, K. R., Franklin, J. C., Ribeiro, J. D., Kleiman, E. M., Bentley, K. H., & Nock, M. K. (2015). Meta-analysis of risk factors for nonsuicidal self-injury. *Clinical Psychology Review*, 42, 156–167. <https://doi.org/10.1016/j.cpr.2015.09.002>.
- Glenn, C. R., & Klonsky, E. D. (2011). Prospective prediction of nonsuicidal self-injury: A 1-year longitudinal study in young adults. *Behavior Therapy*, 42(4), 751–762. <https://doi.org/10.1016/j.beth.2011.04.005>.
- Gonzales, A. H., & Bergstrom, L. (2013). Adolescent non-suicidal self-injury (NSSI) interventions. *Journal of Child and Adolescent Psychiatric Nursing*, 26(2), 124–130. <https://doi.org/10.1111/jcap.12035>.
- Griffin, E., McMahon, E., McNicholas, F., Corcoran, P., Perry, I. J., & Arensman, E. (2018). Increasing rates of self-harm among children, adolescents and young adults: A 10-year national registry study 2007–2016. *Social Psychiatry and Psychiatric Epidemiology*, 53(7), 663–671. <https://doi.org/10.1007/s00127-018-1522-1>.
- Guérin-Marion, C., Martin, J., Deneault, A.-A., Lafontaine, M.-F., & Bureau, J.-F. (2018). The functions and addictive features of non-suicidal self-injury: A confirmatory factor analysis of the Ottawa self-injury inventory in a university sample. *Psychiatry Research*, 264, 316–321. <https://doi.org/10.1016/j.psychres.2018.04.019>.
- Hammer, R., Dingel, M., Ostergren, J., Partridge, B., McCormick, J., & Koenig, B. A. (2013). Addiction: Current criticism of the brain disease paradigm. *AJOB Neuroscience*, 4(3), 27–32. <https://doi.org/10.1080/21507740.2013.796328>.
- Harrison, L. N. (2020). *Sex and intimacy in the postpartum period: A qualitative Reddit analysis of women's and men's experiences*. <https://uwspace.uwaterloo.ca/handle/10012/16354>.
- Harris, I. M., & Roberts, L. M. (2013). Exploring the use and effects of deliberate self-harm websites: An internet-based study. *Journal of Medical Internet Research*, 15(12), e2802. <https://doi.org/10.2196/jmir.2802>.
- Harvey, K., & Brown, B. (2012). Health communication and psychological distress: Exploring the language of self-harm. *The Canadian Modern Language Review*, 68(3), 316–340. <https://doi.org/10.3138/cmlr.1103>.
- Huang, X., Ribeiro, J. D., & Franklin, J. C. (2020). The differences between suicide ideators and suicide attempters: Simple, complicated, or complex? *Journal of Consulting and Clinical Psychology*, 88(6), 554. <https://doi.org/10.1037/ccp0000498>.
- International Society for the Study of Self-injury (2018, May). What is nonsuicidal self-injury? <https://itriples.org/about-self-injury/what-is-self-injury>.
- Johnson, G. M., Zastawny, S., & Kulpa, A. (2010). E-message boards for those who self-injure: Implications for E-health. *International Journal of Mental Health and Addiction*, 8(4), 566–569. <https://doi.org/10.1007/s11469-009-9237-x>.
- Jurafsky, D., & Martin, J. H. (2009). *Speech and language processing: An introduction to natural language processing, computational linguistics, and speech recognition (second)*. Prentice Hall.
- Klonsky, E. D. (2007). The functions of deliberate self-injury: A review of the evidence. *Clinical Psychology Review*, 27(2), 226–239. <https://doi.org/10.1016/j.cpr.2006.08.002>.
- Kraemer, H. C., Kupfer, D. J., Clarke, D. E., Narrow, W. E., & Regier, D. A. (2012). DSM-5: How reliable is reliable enough? *American Journal of Psychiatry*, 169(1), 13–15. <https://doi.org/10.1176/appi.ajp.2011.11010050>.
- Landis, J. R., & Koch, G. G. (1977). The measurement of observer agreement for categorical data. *Biometrics*, 33(1), 159–174. <https://doi.org/10.2307/2529310>.
- Lesieur, H. R., & Blume, S. B. (1993). Pathological gambling, eating disorders, and the psychoactive substance use disorders. *Journal of Addictive Diseases*, 12(3), 89–102. https://doi.org/10.1300/J069v12n03_08.
- Lewis, S. P., & Seko, Y. (2015). A double-edged sword: A review of benefits and risks of online nonsuicidal self-injury activities. *Journal of Clinical Psychology*, 72(3), 249–262. <https://doi.org/10.1002/jclp.22242>.
- Martin, J., Cloutier, P. F., Levesque, C., Bureau, J.-F., Lafontaine, M.-F., & Nixon, M. K. (2013). Psychometric properties of the functions and addictive features scales of the Ottawa self-injury inventory: A preliminary investigation using a university sample. *Psychological Assessment*, 25(3), 1013–1018. <https://doi.org/10.1037/a0032575>.
- Matero, M., Idnani, A., Son, Y., Giorgi, S., Vu, H., Zamani, M., . . . Schwartz, H. A. (2019). Suicide risk assessment with multi-level dual-context language and BERT. *Proceedings of the Sixth Workshop on Computational Linguistics and Clinical Psychology*, 39–44. <https://doi.org/10.18653/v1/W19-3005>.
- Meinhardt, J., & Pekrun, R. (2003). Attentional resource allocation to emotional events: An ERP study. *Cognition and Emotion*, 17(3), 477–500. <https://doi.org/10.1080/02699930244000039>.
- Mihordin, R. (2012). Behavioral addiction—Quo vadis? *The Journal of Nervous and Mental Disease*, 200(6), 489–491. <https://doi.org/10.1097/NMD.0b013e318257c503>.
- Muele, A., & Gearhardt, A. N. (2014). Food addiction in the light of DSM-5. *Nutrients*, 6(9), 3653–3671. <https://doi.org/10.3390/nu6093653>.
- Murray, C. D., & Fox, J. (2006). Do internet self-harm discussion groups alleviate or exacerbate self-harming behaviour? *Australian E-Journal for the Advancement of Mental Health*, 5(3), 225–233. <https://doi.org/10.5172/jamh.5.3.225>.
- Niwa, K. D., & Mandrusiak, M. N. (2012). Self-injury groups on Facebook. *Canadian Journal of Counselling and Psychotherapy*, 46(1) Article 1 <https://cjc-ccc.ualgary.ca/article/view/59313>.
- Nixon, M. K., Cloutier, P. F., & Aggarwal, S. (2002). Affect regulation and addictive aspects of repetitive self-injury in hospitalized adolescents. *Journal of the American Academy of Child and Adolescent Psychiatry*, 41(11), 1333–1341. <https://doi.org/10.1097/00004583-200211000-00015>.



- Nixon, M. K., Levesque, C., Preyde, M., Vanderkooy, J., & Cloutier, P. F. (2015). The Ottawa Self-Injury Inventory: Evaluation of an assessment measure of nonsuicidal self-injury in an inpatient sample of adolescents. *Child and Adolescent Psychiatry and Mental Health*, 9, 26. <https://doi.org/10.1186/s13034-015-0056-5>.
- Nock, M. K., & Prinstein, M. J. (2004). A functional approach to the assessment of self-mutilative behavior. *Journal of Consulting and Clinical Psychology*, 72(5), 885–890. <https://doi.org/10.1037/0022-006X.72.5.885>.
- Park, J. Y. E., Howren, A. M., Davidson, E., & De Vera, M. A. (2020). Insights on mental health when living with rheumatoid arthritis: A descriptive qualitative study of threads on the Reddit website. *BMC Rheumatology*, 4(1), 62. <https://doi.org/10.1186/s41927-020-00163-2>.
- Pennebaker, J. W., Boyd, R. L., Jordan, K., & Blackburn, K. (2015). The development and psychometric properties of LIWC2015. <https://repositories.lib.utexas.edu/handle/2152/31333>.
- Petry, N. M., Zajac, K., & Ginley, M. K. (2018). Behavioral addictions as mental disorders: To be or not to be? *Annual Review of Clinical Psychology*, 14, 399–423. <https://doi.org/10.1146/annurev-clinpsy-032816-045120>.
- Potenza, M. N. (2006). Should addictive disorders include non-substance-related conditions? *Addiction*, 101(s1), 142–151. <https://doi.org/10.1111/j.1360-0443.2006.01591.x>.
- Proferes, N., Jones, N., Gilbert, S., Fiesler, C., & Zimmer, M. (2021). Studying Reddit: A systematic overview of disciplines, approaches, methods, and ethics. *Social Media + Society*, 7(2), 20563051211019004. <https://doi.org/10.1177/20563051211019004>.
- Rodham, K., Gavin, J., & Miles, M. (2007). I hear, I listen and I care: A qualitative investigation into the function of a self-harm message board. *Suicide and Life-Threatening Behavior*, 37(4), 422–430. <https://doi.org/10.1521/suli.2007.37.4.422>.
- Sharma, R., Wigginton, B., Meurk, C., Ford, P., & Gartner, C. E. (2017). Motivations and limitations associated with vaping among people with mental illness: A qualitative analysis of Reddit discussions. *International Journal of Environmental Research and Public Health*, 14(1), 7. <https://doi.org/10.3390/ijerph14010007>.
- Shing, H.-C., Nair, S., Zirikly, A., Friedenber, M., Daumé, H., III, & Resnik, P. (2018). Expert, crowdsourced, and machine assessment of suicide risk via online postings. *Proceedings of the fifth workshop on computational linguistics and clinical psychology: from keyboard to clinic* (pp. 25–36). <https://doi.org/10.18653/v1/W18-0603>.
- Stenbacka, C. (2001). Qualitative research requires quality concepts of its own. *Management Decision*, 39(7), 551–556. <https://doi.org/10.1108/EUM0000000005801>.
- 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 & Life-Threatening Behavior*, 44(3), 273–303. <https://doi.org/10.1111/sltb.12070>.
- 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(11), 576–585. <https://doi.org/10.1177/070674371405901103>.
- VERBI Software (2019). MAXQDA 2020 [computer software]. Berlin, Germany: VERBI Software. Available from maxqda.com.
- Victor, S. E., Glenn, C. R., & Klonsky, E. D. (2012). Is non-suicidal self-injury an “addiction”? A comparison of craving in substance use and non-suicidal self-injury. *Psychiatry Research*, 197, 73–77. <https://doi.org/10.1016/j.psychres.2011.12.011>.
- Victor, S. E., & Klonsky, E. D. (2014). Correlates of suicide attempts among self-injurers: A meta-analysis. *Clinical Psychology Review*, 34(4), 282–297. <https://doi.org/10.1016/j.cpr.2014.03.005>.
- Warthan, M. M., Uchida, T., & Wagner, R. F., Jr. (2005). UV light tanning as a type of substance-related disorder. *Archives of Dermatology*, 141(8), 963–966. <https://doi.org/10.1001/archderm.141.8.963>.
- Washburn, J. J., Juzwin, K. R., Styer, D. M., & Aldridge, D. (2010). Measuring the urge to self-injure: Preliminary data from a clinical sample. *Psychiatry Research*, 178(3), 540–544. <https://doi.org/10.1016/j.psychres.2010.05.018>.
- Wester, K., Trepal, H., & King, K. (2018). Nonsuicidal self-injury: Increased prevalence in engagement. *Suicide and Life-Threatening Behavior*, 48(6), 690–698. <https://doi.org/10.1111/sltb.12389>.
- Whitlock, J. L., Powers, J. L., & Eckenrode, J. (2006). The virtual cutting edge: The internet and adolescent self-injury. *Developmental Psychology*, 42(3), 407–417. <https://doi.org/10.1037/0012-1649.42.3.407>.
- Williamson, E., Gregory, A., Abrahams, H., Aghtaie, N., Walker, S.-J., & Hester, M. (2020). Secondary trauma: Emotional safety in sensitive research. *Journal of Academic Ethics*, 18(1), 55–70. <https://doi.org/10.1007/s10805-019-09348-y>.
- Woodby, L. L., Williams, B. R., Wittich, A. R., & Burgio, K. L. (2011). Expanding the notion of researcher distress: The cumulative effects of coding. *Qualitative Health Research*, 21(6), 830–838. <https://doi.org/10.1177/1049732311402095>.
- Zomick, J., Levitan, S. I., & Serper, M. (2019). Linguistic analysis of schizophrenia in Reddit posts. *Proceedings of the Sixth Workshop on Computational Linguistics and Clinical Psychology*, 74–83. <https://doi.org/10.18653/v1/W19-3009>.



APPENDIX

Table A1. Adaptation of DSM-5 SUD symptoms to NSSI, present study

Diagnostic and Statistical Manual 5 (DSM-5) Substance Use Disorder (APA, 2013)	Present study	Notes
Important social, recreational, or occupational activities are reduced or given up because of the use of the substance.	Important social, recreational, or occupational activities are reduced or given up because of NSSI.	
The substance is often taken in larger amounts or over a longer period than was intended.	Acts of NSSI are often deeper (in the case of cutting), more severe, or occur more often than was intended.	
Persistent desire or unsuccessful efforts to cut down or control the use of the substance.	Persistent desire or unsuccessful efforts to cut down or control NSSI.	
Recurrent substance use in situations in which it is physically hazardous.	Recurrent NSSI in situations in which it is physically hazardous.	Coders were instructed to select this criterion when NSSI was particularly dangerous or severe: specifically, NSSI that required medical attention (whether or not it was sought by the user), resulted in infection, or, in the case of cutting, reached a depth that would result in permanent scarring.
The substance use is continued despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to have been caused or exacerbated by the use of the substance.	NSSI is continued despite knowledge of a psychological problem that is likely to have been caused or exacerbated NSSI.	Coders were instructed to select this criterion when users acknowledged NSSI exacerbated an existing mental health concern, led to feelings of guilt or shame, or “just made them feel worse.”
A great deal of time is spent in activities necessary to obtain the substance, use the substance, or recover from its effects.	A great deal of time is spent preparing to self-injure, self-injuring, or recovering from NSSI.	
Withdrawal, as manifested by either of the following: (A) the characteristic withdrawal syndrome for the substance; (B) the substance] is taken to relieve or avoid withdrawal symptoms.	Withdrawal, as manifested by recurring physical tension levels when NSSI is discontinued.	NSSI does not have a characteristic withdrawal syndrome. Coders were given an interpretation from Nixon et al. (2002): “tension level reoccurs if NSSI is discontinued,” and instructed to focus on <i>physical</i> sensations of agitation (as opposed to craving, which is would be considered mental/psychological).
Craving, or a strong desire or urge to use the substance.	Craving, or a strong desire or urge to self-injure.	
Recurrent substance use resulting in a failure to fulfill major role obligations at work, school, or home.	Recurrent NSSI resulting in a failure to fulfill major role obligations at work, school, or home.	
Continued use of the substance despite having persistent or recurrent social or interpersonal problems caused or exacerbated by the effects of the substance.	Continued NSSI despite having persistent or recurrent social or interpersonal problems caused or exacerbated by NSSI.	
Tolerance, as defined by either of the following: (A) A need for markedly increased amounts of the substance to achieve intoxication or desired effect; (B) A markedly diminished effect with continued use of the same amount of the substance.	Tolerance, as defined by either of the following: (A) A need for markedly increased severity, frequency, or depth (in the case of cutting) of NSSI to achieve the desired effect; (B) A markedly diminished effect with continued levels of severity, frequency, or depth of NSSI.	Continued NSSI does not lead to physical tolerance. Coders were given an interpretation from Nixon et al. (2002): “NSSI occurs more often and/or the severity has increased [since starting].”

Summary of the 11 DSM-5 SUD criteria and how they were adapted for NSSI to the present study. Notes are provided in cases when the adaptation was less straightforward.



Table A2. Descriptive statistics: Psychiatric disorders

Psychiatric disorder	<i>n</i>	%	κ	agreement
Depression	243	48.6	0.77	substantial
Anxiety; panic attacks	200	40	0.77	substantial
Trauma; PTSD	26	5.2	0.57	moderate
Eating disorder	17	3.4		
Borderline Personality Disorder	16	3.2	0.86	almost perfect
Obsessive-Compulsive Disorder	15	3	0.86	perfect
Schizophrenia; other psychotic disorder	14	2.8		
Bipolar disorder	10	2	0.62	substantial
Substance Use Disorder	9	1.8		
Autism Spectrum Disorder	5	1		
Picking disorder	5	1		
Suicidality	320	64	0.72	substantial

Psychiatric disorders in descending order of the number of r/selfharm users ($n = 500$) disclosing a diagnosis of or concern with that disorder. κ = Fleiss's kappa statistic, an indicator of intercoder reliability. Interpretation of κ (from Landis & Koch, 1977) is also reported. All values of κ were significantly better than chance agreement at the $P < 0.001$ level. Items with associated κ 's are from an a priori codebook, while no κ 's are reported for additional disorders or concerns added to the codebook post hoc. These additional items were disclosed by at least 1% of users ($n = 5$), after resolving disagreements between coders.

Table A3. Descriptive statistics: Methods for NSSI

Method for NSSI	<i>n</i>	%	κ	agreement
Cutting	461	92.2	0.21	fair
Hitting; bruising	86	17.2	0.81	almost perfect
Scratching; picking	72	14.4	0.67	substantial
Burning	68	13.6	0.86	almost perfect
Biting	24	4.8	0.87	almost perfect
Starving; food restriction	21	4.2		
Purging	7	1.4		
Overdose	7	1.4		

Methods for self-injury in descending order of the number of r/selfharm users ($n = 500$) mentioning having used that method at least once. κ = Fleiss's kappa statistic, an indicator of intercoder reliability. Interpretation of κ (from Landis & Koch, 1977) is also reported. All values of κ were significantly better than chance agreement at the $P < 0.001$ level. Items with associated κ 's are from an a priori codebook, while no κ 's are reported for additional methods added to the codebook post hoc. These additional items were mentioned by at least 1% of users ($n = 5$), after resolving disagreements between coders.

