ORIGINAL ARTICLE

Does Nonsuicidal Self-injury Prospectively Predict Change in Depression and Self-criticism?

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Abstract

Few studies have investigated nonsuicidal self-injury (NSSI) as a predictor of outcomes other than suicidal self-injury, severely limiting our understanding of this behavior's full range of consequences. Three independent studies were used to examine the prospective association between NSSI and two outcomes: depressive symptoms and self-criticism. Data were collected from samples of (1) adults with past-month NSSI, (2) adults with lifetime NSSI, and (3) adults with past-year NSSI. Studies included 1- and 6-month follow-up periods. Results were tested in an internal meta-analysis. Results suggested that NSSI did not prospectively predict changes in self-criticism. No changes in depressive symptoms were seen over shorter follow-up periods; however, NSSI predicted increases in depressive symptoms at 6-month follow-up in one sample. The internal meta-analysis indicated a null relationship between NSSI and prospective internalizing symptoms. Future research should replicate these findings and examine a broader range of outcomes of NSSI to better understand its complex relationship to psychopathology.

Keywords Nonsuicidal self-injury · Depression · Self-criticism

Nonsuicidal self-injury (NSSI) is defined as direct and deliberate harm to oneself without suicidal intent (Nock 2010). Common methods of NSSI include cutting, burning, biting, hitting, scratching, and inserting objects beneath the skin (Nock 2010). Research suggests that NSSI occurs in up to 17% of adolescents (Swannell et al. 2014) and 5% of adult community samples, and at significantly higher rates among clinical samples of both adolescents and adults (upwards of 50%; e.g., DiClemente et al. 1991). Although NSSI occurs without suicidal intent, a growing body of literature suggests that the behavior is one of the strongest predictors of future suicidal behavior (Ribeiro et al. 2016). Moreover, greater NSSI severity (often operationalized as greater frequency, medical severity, and number of methods) is one of the strongest correlates of suicidal behaviors among those with a history of NSSI (e.g., Burke et al. 2018; Kiekens et al. 2018; Victor and Klonsky 2014). Thus, studying NSSI and the mechanisms that maintain or exacerbate this behavior is of utmost importance.

Research suggests that the most common reasons cited for engaging in NSSI involve reduction of aversive emotional states, including to escape negative thoughts or stop bad feelings (Klonsky 2009; Taylor et al. 2018). In line with this finding, depressive symptomatology and self-criticism have been found to be strongly associated with engagement in NSSI. Although a large body of research has examined these internalizing symptoms as predictors of NSSI, few studies have examined the extent to which NSSI may in turn influence these symptoms. Indeed, somewhat surprisingly, the prospective relations of NSSI to outcomes other than suicidal behavior have rarely been examined. Understanding the predictive relations between NSSI and other aspects of psychopathology is a critical first step to appreciating the potential impact of this behavior, including mechanisms by which it may be reinforced and maintained.

A large body of research highlights the cross-sectional association between self-criticism and NSSI (see Zelkowitz

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and Cole 2018 for a review). Preliminary research aimed at better understanding the direction of this association suggests that self-criticism (Fox et al. 2018) and low self-esteem (Forrester et al. 2017; Garisch and Wilson 2015; Tatnell et al. 2014) predict subsequent NSSI. It is unclear whether engaging in NSSI leads to increased self-criticism, however. Providing initial support for this possibility, Klonsky (2009) found that many people who engage in NSSI retrospectively report experiencing shame, guilt, and self-directed anger after engaging in these behaviors. It is also possible that the physical consequences (e.g., scarring, bruising) of NSSI may lead to increases in self-criticism over the longer-term. Supporting this notion, recent research has demonstrated strong negative implicit and explicit biases towards those who bear scarring from NSSI (Burke et al. in press). More generally, the literature supports negative perceptions of self-harm among some providers, and suggests that individuals who self-harm are aware of such perceptions (e.g., Mitten et al. 2016; Taylor et al. 2009). Given literature suggesting that stigmatized individuals experience low self-esteem, negative affect, and shame (Heatherton et al. 2000; Link et al. 1997; Hinshaw and Stier 2008), it is plausible that engagement in NSSI may lead to greater self-criticism, as well as greater depressive symptoms.

Echoing literature on self-criticism and NSSI, a large body of research demonstrates a strong cross-sectional association between depression and NSSI (see Jacobson and Gould 2007; Nitkowski and Petermann 2011 for reviews). Although there is evidence that depression is a risk factor for NSSI (e.g., Hankin and Abela 2011), whether NSSI exacerbates depressive symptoms remains unclear. NSSI appears to reduce high arousal negative affect in the immediate moments during or following these behaviors (e.g., Franklin et al. 2013; Fox et al. 2017), but preliminary evidence suggests it may lead to greater negative affective experiences over longer periods of time. Indeed, Houben et al. (2017) documented increases in negative mood in the hours following NSSI in an inpatient sample of individuals with borderline personality disorder. If replicated, such findings would suggest that NSSI may exacerbate a key symptom of depression.

Existing research on the association between NSSI and prospective depressive symptoms is mixed. Whereas some studies indicate that past 6-month and lifetime NSSI predict increases in depressive symptoms among adolescent boys and girls (Mars et al. 2014), other research indicates that this association is specific to adolescent girls (Burke et al. 2015; Lundh et al. 2011a, b). Marshall et al. (2013), in contrast, did not find evidence for the effect of NSSI on depressive symptoms at 1 or 2-year follow-up periods among adolescent girls and boys.

Limitations of past research on NSSI as a predictor of internalizing symptoms may shed light on these mixed findings. First, studies generally have assessed lifetime (e.g., Mars et al. 2014) and past-year NSSI (e.g., Burke et al. 2015). Although valuable, using lifetime or even past-year NSSI histories does not allow for tests of whether these behaviors predict increases in internalizing symptoms in the shorter-term. To this end, studies of NSSI consequences over shorter periods (e.g., past month) are necessary. Second, most of the extant studies have been conducted with the same type of sample (often community-based). This limits our ability to compare associations across different types of samples, including clinical samples where engagement in NSSI may be both current and frequent. Third, previous research on this topic has primarily focused on adolescents. Although NSSI engagement is most common among adolescents, NSSI is also prevalent among young adults (Swannell et al. 2014).

Current Study

In order to address the aforementioned limitations, the current investigation sought to test whether recent (i.e., past month) NSSI predicts increases in self-criticism and depressive symptoms. This association was examined in three independent studies using samples of adults with varying lifetime severities of NSSI. We hypothesized that recent NSSI engagement would predict increases in depressive symptoms and self-criticism. The studies aimed to provide a rigorous examination of this hypothesis by using different assessment strategies (in-person vs online) and samples varying in age and NSSI recency and severity. Further, the current study used an internal meta-analysis (see Goh et al. 2016, for further information) based on the three studies to synthesize evidence of these associations across our studies.

Study 1–3 Methods and Results

Analytical Overview

We used linear regression to assess past month NSSI frequency as a predictor of depressive symptoms and self-criticism among individuals with a history of NSSI. Where we had multiple measures of self-criticism (Study 2), we also used a latent variable approach to assess the effect of NSSI on self-criticism. We examined outcomes at 1 month (Studies 1 and 2) and 6 months after baseline (Study 3). Although we had predictions about the likely direction of any differences, two-tailed hypothesis tests were used in an effort to adopt a more conservative approach. All analyses were conducted in SPSS v. 23.0 or 24.0. Post-hoc power analyses were conducted using GPower (Faul et al. 2007). Based on the sample sizes for each study, we were sufficiently powered

Table 1 Zero-order correlations of baseline NSSI and depressive symptoms, self-criticism by study and wave

Study no.	NSSI1, BDI1	NSSI1, BDI2	NSSI1, SRS1	NSSI1, SRS2	NSSI1, FSC1	NSSI1, FSC2	NSSI1, DEQ1	NSSI, DEQ2
1[a]	0.23**	0.27**	0.17*	0.19*	n/a	n/a	n/a	n/a
2	0.15*	0.07	0.19*	0.12	0.21*	− 0.02	0.14	0.12
3[a]	0.29**	0.26*	0.29**	0.24*	n/a	n/a	n/a	n/a

All correlations expressed as Spearman's rho

FSC forms of self-criticism, self-reassurance scale (inadequate self, hated self combined total), *DEQ* depressive experiences questionnaire, self-criticism subscale

*$p < 0.05$

[a]FSC and DEQ not administered in Studies 1 and 3

Table 2 Schematic of study and sample characteristics across all three studies

Study no.	Age mean (SD)	% female gender	Follow-up periods	% retention rate	Lifetime NSSI Mean (SD)/% endorsed	Past month NSSI Mean (SD)/% endorsed
1	22.53 (4.62)	85.42	4 weeks	87.50	1042.43 (1908.49)/100%	8.99 (11.59)/100%
2	24.81 (3.69)	92.10	4 weeks	47.00	133.29 (841.03)/100%	2.81 (16.91)/26.40%
3	22.53 (4.62)	78.35	6 months	82.47	255.75 (316.32)/100%	3.14 (5.48)/63.82%

Female refers to female gender

(i.e., power > 0.90) to detect a medium-sized effect for the change due to the inclusion of NSSI as a model predictor. Correlations between baseline NSSI, depressive symptoms, and self-criticism at baseline and at follow-up were examined and are reported in Table 1.

Study 1

Participants and Procedure

Participants were 144 adults (123 female) aged 18–45 years who reported two or more past-month NSSI episodes (see Table 2 for descriptive information on all study samples). Participants primarily identified as Caucasian (87.50%) and reported living in the United States (71.53%). These participants were part of a larger, online treatment study.[1] Study recruitment techniques, inclusion criteria, detailed methods, and additional sample characteristics are described elsewhere (Hooley et al. in press). Briefly, participants were recruited online and randomized into one of three daily-diary treatment conditions designed to reduce engagement in NSSI. Regardless of treatment group, participants completed a baseline assessment and the majority completed a follow-up assessment 4 weeks later (Week 4 N = 126). Informed consent was obtained from all participants.

Measures

Self-Injurious Thoughts and Behaviors Interview (SITBI) The SITBI (Nock et al. 2007). The SITBI assesses history of self-injurious thoughts and behaviors. Participants are asked how many times they have engaged in NSSI over a variety of time periods (i.e., past week, past month, past year, and lifetime). They also indicate the specific behaviors in which they have engaged, along with ratings for possible functions of and contributors to the behavior(s). The interview has very strong interrater reliability (average κ = 0.99) as well as strong convergent and construct validity, indexed by its association with other measures of self-injurious thoughts and behaviors (Nock et al. 2007). In the present study, the online version of the SITBI was used. Prior research indicates that online and in-person versions of the SITBI produce similar SITB estimates (Franklin et al. 2014).

Beck Depression Inventory-II (BDI-II) The BDI-II (Beck et al. 1996). The BDI-II is a 21-item self-report measure used to assess symptoms of depression. All items are rated on a 4-point Likert scale, with higher scores indexing more severe depressive symptoms. The BDI-II demonstrates high internal consistency (Beck et al. 1996) as well as convergent and discriminant validity among psychiatric outpatients (Steer et al. 1999). In the present sample, the coefficient alpha was 0.92 at Wave 1 and 0.94 at Wave 2. At baseline, average BDI scores were 37.41 (*SD* = 14.21); at follow-up, average BDI scores were 29.99 (*SD* 16.18). Baseline and follow-up BDI scores were correlated at 0.76 ($p < 0.01$).

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[1] Analyses not reported here indicated that results were not affected when including treatment group as a covariate. These results are available upon request.

Table 3 NSSI as a predictor of depressive symptoms at 4 and 26 weeks

Predictor (NSSI measure)	b	SE	B	t
DV = Depressive symptoms at 4 weeks				
Past month NSSI frequency (Study 1)	0.25	0.31	0.05	0.81
Baseline depressive symptoms	0.83	0.07	0.75	12.15***
Past month NSSI frequency (Study 2)	0.04	0.07	0.04	0.55
Baseline depressive symptoms	0.78	0.08	0.70	8.79***
DV = Depressive symptoms at 6 months (i.e., 26 weeks)				
Past-month NSSI frequency (Study 3)	0.57	0.24	0.22	2.35*
Baseline depressive symptoms	0.63	0.10	0.58	6.37***

All analyses controlled for depressive symptoms at baseline

NSSI nonsuicidal self-injury, *DV* dependent variable

^p < 0.10; *p < 0.05; **p < 0.01; ***p < 0.001

Self-Rating Scale (SRS) The SRS (Hooley et al. 2010) is a brief, 8-item measure used to assess self-critical cognitions. Items are answered on a 7-point Likert scale, with higher scores indexing higher levels of self-criticism. Items include, "I often feel inferior to others," and "I am socially inept and undesirable." The SRS demonstrates good internal reliability and differentiates groups with and without NSSI histories (Hooley et al. 2010; St. Germain and Hooley 2012). In the present sample, the coefficient alpha was 0.84 at Wave 1 and 0.94 at Wave 2. At baseline, average SRS scores were 41.88 (*SD* = 9.16); at follow-up, average SRS scores were 40.96 (*SD* 11.74). Baseline and follow-up SRS scores were correlated at 0.81 (*p* < 0.01).

Results

Aim 1: Does Past Month NSSI Frequency at Baseline Predict Depressive Symptoms 1 Month Later, Controlling for Baseline Depressive Symptoms?

As indicated in Table 3, after controlling for depressive symptoms at baseline, past-month NSSI frequency did not predict depressive symptoms reported at 1-month follow-up.

Aim 2: Does Past-Month NSSI Frequency at Baseline Predict Self-criticism 1 Month Later, Controlling for Baseline Self-criticism?

As seen in Table 4, after controlling for self-criticism at baseline, past month NSSI frequency did not predict subsequent self-criticism reported at 1-month follow-up.

Study 2

Participants and Procedure

Participants were selected from a broader study of adults recruited via an online survey platform (Qualtrics Panels). Participants in the broader study were recruited based on

Table 4 NSSI as a predictor of self-criticism at 4 and 26 weeks

Predictor (NSSI measure)	b	SE	B	t
DV = SRS score at 4 weeks				
Past month NSSI frequency (Study 1)	0.06	0.06	0.06	0.93
Baseline SRS	0.93	0.09	0.69	10.66***
Past month NSSI frequency (Study 2)	0.06	0.06	0.09	1.12
Baseline SRS	0.73	0.09	0.65	7.78***
DV = DEQ score at 4 weeks				
Past-month NSSI frequency (Study 2)	0.06	0.05	0.10	1.24
Baseline DEQ	0.62	0.08	0.64	7.58***
DV = FSCSRS-inadequate self score at 4 weeks				
Past-month NSSI frequency (Study 2)	−0.02	0.04	−0.05	−0.63
Baseline FSCSRS-inadequate self	0.84	0.09	0.72	9.28**
DV = FSCSRS-hated self score at 4 weeks				
Past-month NSSI frequency (Study 2)	0.00	0.02	0.00	0.005
Baseline FSCSRS-hated self score	0.67	0.09	0.63	7.31**
DV = SRS score at 6 months (i.e., 26 weeks)				
Past-month NSSI frequency (Study 3)	0.17	0.16	0.09	1.12
Baseline SRS	0.77	0.09	0.69	8.51***

SRS Self-rating scale, *DEQ* depressive experiences questionnaire, *FSCSRS* forms of self-criticism and self-reassurance scale, *DV* dependent variable

***p < 0.001

Note: Lifetime frequency of NSSI significantly predicted FSCSRS-hated self score among females only (n = 26; *b* = 0.34, *SE* = 0.14, β = 0.39, *t* = 2.41)

lifetime history of either NSSI or disordered eating. The present sample consisted of 178 adults reporting lifetime histories of NSSI (5.6% male, 2.2% transgender). The sample was moderately diverse (76.40% Caucasian, 13.48% African American, 13.48% Hispanic or Latino, 4.49% Asian or Asian American, 2.81% Native American, 0.56% Other; participants could endorse more than one race or ethnicity.) Forty-six percent of the sample reported past-year NSSI; 26% of the sample reported self-injuring in the past month (see Table 2). All participants were between the ages of 18 and 30 years. Participants completed an online battery of self-report measures and were contacted for an online follow-up assessment after four weeks. Of those completing baseline assessments, 83 completed follow-up questionnaires. Analyses were completed using full information maximum likelihood (FIML) to make optimal use of available data.[2] Informed consent was obtained from all participants.

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[2] Results did not vary with the use of FIML or listwise deletion.

Measures

As in Study 1, participants completed the online SITBI and BDI-II to measure NSSI and depressive symptoms, respectively. Unlike Study 1, the BDI-II item about suicidal ideation was removed for safety concerns, leaving 20 items. Despite this alteration, coefficient alpha was 0.95 at Wave 1 and 0.96 at Wave 2. Mean BDI score at baseline was 22.39 (SD = 13.02); mean at follow-up was 21.68 (SD = 14.52). Correlation from baseline to follow-up was 0.70 ($p < 0.01$). Participants also completed the SRS (coefficient as = 0.86 − 0.91). Mean SRS score at baseline was 36.08 (SD = 10.26); mean at follow-up was 35.88 (SD = 11.53). Scores were significantly correlated across waves ($r = 0.66$, $p < 0.01$). In an effort to enhance reliability of our assessment of self-criticism and facilitate comparisons across the broader literature on the construct, we administered two additional SC measures (see below).

Depressive Experiences Questionnaire (DEQ) The DEQ (Blatt et al. 1976) is a 66-item measure developed to measure feelings and cognitions associated with depression (as distinct from more normative negative affect). It uses 1–7 Likert scales ("strongly disagree" to "strongly agree"). Factor analysis reveals three subscales: self-criticism, dependency, and efficacy. The measure has been validated among undergraduates and has coefficient alphas ranging from 0.73 to 0.81. Analyses focus on the self-criticism subscale score as characterized by Bagby, Parker, Joffe, and Buis (1994). Representative items include "There is a considerable difference between how I am now and how I would like to be" and "I often find I don't live up to my own standards or ideals." Coefficient alphas were 0.81 at Wave 1 and 0.78 at Wave 2. At baseline, mean DEQ score was 42.02 (SD = 9.87); mean DEQ at follow-up was 41.21 (SD = 10.14). Baseline and follow-up scores were significantly correlated ($r = 0.64$, $p < 0.01$).

Forms of Self-Criticism/Self-Reassurance Scale (FSC-SRS) The FSCSRS (Gilbert et al. 2004) is a 24-item measure that produces two subscales relevant to self-criticism: Inadequate Self and Hated Self. Participants note their agreement with each statement on a 0–4 ("not at all like me" to "extremely like me") scale. We removed one item from the Hated Self scale ("I have become so angry with myself that I want to hurt or injure myself") due to high conceptual overlap with NSSI. Coefficient alphas were 0.78 and 0.84 (Waves 1 and 2) for the Hated Self scale and 0.86 and 0.90 for the Inadequate Self scale. At baseline, mean Hated Self score was 12.65 (SD = 4.39); mean Inadequate Self score was 35.56 (SD = 6.68). At follow-up mean Hated Self score was 12.76 (SD = 4.11); mean Inadequate self score at follow-up was 34.74 (SD = 7.78).

Hated Self scores were correlated across waves ($r = 0.63$, $p < 0.01$), as were Inadequate Self scores ($r = 0.71$, $p < 0.01$).

Scores for the SRS, DEQ, and FSCSRS were strongly correlated (at both waves, all pairwise rs > 0.60, $p < 0.01$). We also tested a single latent variable indicator as a measure of self-criticism at Waves 1 and 2. For the purposes of latent variable modeling, we combined both subscales of the FSCSRS. Factor loadings for each self-criticism measure exceeded 0.79 at both waves. (Both models were fully identified, thus fit statistics are non-interpretable.)

Results

Aim 1: Does Past Month NSSI Frequency Predict Depressive Symptoms at 1-Month Follow-Up, Controlling for Baseline Depressive Symptoms?

Past month NSSI frequency did not predict depressive symptoms at 1-month follow-up after controlling for baseline depressive symptoms. See Table 3.

Aim 2: Does Past-Month NSSI Frequency Predict Self-criticism at 1-Month Follow-Up, Controlling for Baseline Self-criticism?

After controlling for baseline SC measure, past-month NSSI frequency did not significantly predict any self-criticism measure score at 1-month follow-up (see Table 4). We also tested the effect of NSSI on self-criticism using a latent variable approach, with all three measures of self-criticism loading onto a latent self-criticism variable. The model fit the data well (e.g., for past-month NSSI frequency, $X^2_9 = 10.78$, $p = 0.29$; CFI = 0.99; IFI = 0.99; NFI = 0.97; RMSEA = 0.03 90% CI [0.00, 0.09]). Results indicated that NSSI did not significantly predict self-criticism at follow-up as measured by this latent variable after controlling for baseline self-criticism.

Study 3

Participants and Procedure

Participants were 97 adults (78.35% female) with a past-year NSSI history recruited from the community and outpatient clinics throughout Boston, MA. More details about the sample and recruitment are described elsewhere (Fox et al. 2017). Briefly, participants primarily identified as Caucasian (73.4%) and were aged 18–38. After completing an in-person baseline assessment, participants were contacted 6 months later for an online follow-up assessment. Of participants who completed baseline, 80 completed the 6-month follow-up assessment. Informed consent was obtained from all participants.

Measures

Study measures were identical to Study 1, including the BDI-II (coefficient alpha 0.89 at Wave 1 and 0.94 at Wave 2) to assess depressive symptoms, SRS (coefficient alpha 0.85 at Wave 1 and 0.88 at Wave 2) to assess self-criticism, and the SITBI to assess self-injurious thoughts and behaviors. Unlike in Study 1, however, the SITBI was administered as an in-person interview at baseline and as a self-report measure online at the six-month follow-up assessment. At baseline, average SRS scores were 35.92 ($SD = 9.17$) and average BDI scores were 26.51 ($SD = 14.05$); at follow-up, average SRS scores were 35.94 ($SD = 10.19$) and average BDI scores were 43.09 ($SD = 14.87$). Baseline and follow-up SRS scores were correlated at 0.71 ($p < 0.01$); baseline and follow-up BDI scores were correlated at 0.62 ($p < 0.01$).

Results

Aim 1: Does Past Month NSSI Frequency at Baseline Predict Depressive Symptoms at 6-Month Follow-Up, Controlling for Baseline Symptoms?

As seen in Table 3, after controlling for depressive symptoms at baseline, past month NSSI frequency significantly predicted depressive symptoms 6 months later.

Aim 2: Does Past Month NSSI Frequency at Baseline Predict Self-criticism at 6-Month Follow-Up, Controlling for Baseline Self-criticism?

As seen in Table 4, controlling for self-criticism at baseline, past month NSSI frequency did not predict self-criticism 6 months later.

Meta-analysis Results

To obtain more reliable estimates of observed effects across these three research studies, we conducted an internal meta-analysis using Comprehensive Meta-Analysis Software 3.0 (Borenstein et al. 2014). We used the unstandardized beta weights and their standard errors to calculate point estimates, standard error (*SE*), and 95% confidence intervals (CI) for the influence of NSSI frequency on depressive symptoms and self-criticism. We used the randomized effects models (see Borenstein et al. 2010) because these models allow for differences across different samples (heterogeneity), thus providing more accurate and generalizable estimates of effect sizes (Lipsey and Wilson 2001). Analyses indicated that 36.38% of the variance observed from the mini meta-analysis could be attributed to between-study rather than within-study variance. This is considered medium heterogeneity and provides support for the use of random effects models (Higgins 2003).

Overall, NSSI did not predict changes in depressive symptoms (point estimate = 0.11, $SE = 0.09$, 95% CI − 0.06 to 0.18, $p = 0.21$) or self-criticism symptoms (point estimate = 0.07, $SE = 0.04$, 95% CI − 0.01 to 0.15, $p = 0.21$), after controlling for baseline levels of these variables. These results remained nonsignificant when considering FIML, rather than listwise deletion, to account for missing data at follow-up time points. Thus, results suggest that when considering these studies in combination, thereby improving statistical power, NSSI frequency does not significantly predict depressive symptoms or self-criticism.

Discussion

The current manuscript describes three longitudinal studies aimed at better understanding the consequences of NSSI engagement for depressive symptoms and self-criticism across a variety of sample types and over two separate time frames. Three main findings emerged. First, we found that within samples reporting NSSI histories, past month NSSI frequency did not predict self-criticism across either a one or six month follow-up period (Studies 1, 2, 3). Similarly, we found that recent NSSI did not significantly predict depressive symptoms over the short-term (i.e., at 1 month follow-up) after controlling for baseline depression (Studies 1, 2). Internal meta-analysis corroborated these findings. We additionally found that NSSI did predict depressive symptoms over the longer term (i.e., 6 month follow-up), although we tested and obtained this result in only one study.

We found no evidence to support the hypothesis that NSSI engagement is associated with changes in self-criticism (assessed using three different measures) over the short or longer term. This finding is strengthened by the consistency of results across the three studies and the maintained null effect in an internal meta-analysis. Results suggest that high self-criticism may be more of a risk factor for NSSI than as a substantive consequence of having engaged in NSSI. This is consistent with prior research indicating that self-criticism may predate NSSI engagement (Hooley et al. 2010), with current theoretical models of NSSI (see Hooley and Franklin 2017), and with research showing that self-criticism longitudinally predicts NSSI (Fox et al. 2018). We acknowledge, however, that we were sufficiently powered to detect only medium-sized effects; the possibility remains that NSSI exerts a small effect on subsequent self-criticism. Moreover, in all three samples, self-criticism at baseline and follow-up were strongly correlated, thus leaving minimal variation to predict from NSSI.

Of course, this is not to say that individuals do not experience guilt, shame, and self-directed anger immediately after engaging in NSSI (Klonsky 2009). Whereas high levels of

trait self-criticism may leave little room for increase over the longer term, state self-criticism may indeed peak in the minutes, hours, and immediate days after NSSI. Providing support for this possibility, Zuroff et al. (2016) observed meaningful distinctions between trait self-criticism and state variations around this mean in a sample of university students. Future research should use ecological momentary assessment (EMA) among those who self-injure to assess for possible changes in the experiences of self-criticism prior to and after NSSI.

Results regarding NSSI as a predictor of changes in depressive symptoms were mixed. Whereas past month NSSI frequency did not predict changes in depressive symptoms 1 month later, it did predict changes in depressive symptoms 6 months later. This was intriguing, particularly given that depressive symptoms at baseline and follow-up were strongly correlated at both 1 and 6 months. Importantly however, correlations between baseline and follow-up depressive symptoms were slightly weaker at 6-month follow up. Thus, it is possible that this significant finding may have resulted from the slightly greater variability in depressive symptoms observed across longer follow-up periods. In this respect, our findings are in line with research suggesting that NSSI history predicts changes in depression over longer-term follow-up periods, including a 1-year follow-up (Lundh et al. 2011a, b) and 2-year follow-up (Mars et al. 2014). These results also are congruent with recent research suggesting that the physical consequences of NSSI are often perceived as a "marker of stigma or shame" (Bachtelle and Pepper 2015, p. 929), which may lead to internalized stigma and depressive symptomatology over longer follow-up periods. However, given that longer-term effects of NSSI on changes in depression only were tested in one of the three present studies, the "mini" meta-analysis suggested a null relation between NSSI and changes in depressive symptoms, and given other mixed findings in the literature (e.g., Marshall et al. 2013), we hesitate to draw firm conclusions from this single finding. We encourage future research to examine the association between NSSI and prospective depression. We also encourage future research to examine whether this relationship may partially account for the association between NSSI and suicide. Future studies should examine these constructs over both shorter (e.g., hours, days, weeks) and longer periods of time (e.g., years) within a longitudinal mediation model to examine this hypothesis more directly.

Although our multi-study approach has clear strengths, several limitations also deserve mention. First, self-criticism, depressive symptoms, and NSSI all were measured via self-report, thus precluding our ability to examine convergence of these constructs across various methods. Indeed, evidence from other laboratory-based studies suggests the potential utility of implicit measures of self-regard, which we were unable to capture in the present work (e.g., Hofmann et al.

2005). Future studies could implement such laboratory-based assessments in addition to the self-report measures to facilitate multi-trait, multi-method examination of these constructs.

Second, although the present studies covered a relatively short and a longer-term follow-up period, only one study examined outcomes over 6 months. We also were unable to examine relations between NSSI and changes in our outcome variables in the very short-term (i.e., assessing dynamic interplay between these constructs on a daily or even hourly basis) or very long-term (i.e., one or more years later). An important next step will be examining the interplay between NSSI, self-criticism and depressive symptoms on a micro-level, for example using EMA methodology or daily diary studies (e.g., Houben et al. 2017; Turner et al. 2016). Future studies also should include measures of other constructs relevant to NSSI, such as anxiety symptoms, guilt, shame, and disordered eating. Participants across all three studies presented here reported lifetime histories of NSSI; self-criticism and depressive symptoms were correspondingly high and largely stable. Future studies should consider examining these relationships in samples of individuals with recent onset of NSSI or even community samples, which might show greater variability in self-criticism and depressive symptoms and potentially enhanced sensitivity to effects of engaging in NSSI.

Finally, it would be helpful to include more racially and ethnically diverse and larger samples in future studies of NSSI (e.g., Batejan et al. 2015; Bresin and Schoenleber 2015; Gholamrezaei et al. 2015). Increased sample sizes with greater diversity among participants would enhance power for detecting even smaller effect sizes than we could assess here, in addition to testing differences in the predictive associations of NSSI with self-criticism and depressive symptoms across different populations.

Despite these limitations, the present set of studies contributes meaningfully to our knowledge of the potential negative consequences of NSSI beyond future suicidal behaviors. As we search for predictors of NSSI, these findings suggest the need to also consider the impact of NSSI on key constructs such as self-criticism and depressive symptoms, as well as other psychological constructs. Only by considering such bi-directional relations will we build a complete understanding of NSSI, including its complex relation to psychopathology.

Compliance with Ethical Standards

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