



Nonsuicidal self-injury scar concealment from the self and others

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ABSTRACT

Despite the high prevalence of nonsuicidal self-injury (NSSI) and resultant physical scarring, few studies have explored the occurrence and psychological implications of concealing NSSI scars. This study examines NSSI scar concealment from the self and others, as well as the cognitive, affective, and self-injury-related correlates of these concealment practices. This study aimed to characterize the extent to which individuals who engage in concealment practices have a history of, or desire to engage in, treatment for NSSI specifically geared towards NSSI scarring. Adults with at least one NSSI scar ($N = 278$) completed online questionnaires measuring NSSI engagement and scarring, scar concealment behaviors, scar-related cognitions, as well as symptoms of anxiety and depression, and recent suicidal ideation and NSSI urges. Results indicate that the degree of scar concealment from the self and from others is associated with greater experiences of negative scar-related cognitions, higher levels of anxiety and depressive symptomatology, and higher severity of NSSI urges. These correlations persisted after accounting for NSSI severity indices, including extent of NSSI scarring, suggesting that scar concealment practices may be important clinical indicators of current distress and potential future self-injury. Future research should explore the extent to which scar concealment practices are longitudinally associated with distress and risk for NSSI maintenance.

1. Introduction

Nonsuicidal self-injury (NSSI) is defined as the deliberate, self-inflicted damage of body tissue without associated suicidal intent and for purposes not socially or culturally sanctioned (International Society for the Study of Self-Injury, 2018). Recent meta-analyses of non-clinical, community-based samples demonstrate approximately 17% of adolescents, 13% of young adults, and 6% of adults report that they have engaged in NSSI at least once in their lifetime (Gillies et al., 2018; Swannell et al., 2014). Engagement in NSSI is not only associated with, but also predictive of future depressive symptoms and suicidal thoughts and behaviors (Hamza et al., 2012; Wilkinson et al., 2011).

One factor that may contribute to the negative psychological sequelae of NSSI is the permanent visible effects of the behavior – scarring. Studies suggest approximately 55% of those with a history of NSSI bear scarring from the behavior (Burke et al., 2016), which is highly stigmatized (Burke et al., 2019). Our previous research suggests

that individuals without NSSI demonstrate strong negative implicit and explicit biases against NSSI scarring compared to non-intentional disfigurement (e.g., accidental injury) and intentional, yet culturally sanctioned, disfigurement (i.e., tattoos). Individuals without NSSI also report being significantly less likely to consider interactions that are platonic (e.g., initiating a friendship), professional (e.g., hiring an employee), or sexual/romantic (e.g., initiating a dating or sexual relationship) with individuals who have scarring from NSSI. Initial evidence also suggests that in addition to experiencing stigma from others, those who engage in NSSI also experience self-stigma, or the internalization of negative stereotypes (Piccirillo et al., 2020). This self-stigma may be reflected in negative beliefs about one's NSSI behavior or scars.

Given evidence of public and self-stigma toward NSSI scarring, it is not surprising that some individuals with NSSI scarring engage in concealment practices (i.e., hiding or covering up scarring). The phenomenon of NSSI scar concealment is supported by findings from narrative studies, clinical case reports, and online forum content

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(Chandler, 2014; Lewis and Mehrabkhani, 2016; Welch et al., 1999), suggesting that individuals conceal their scars from others in a wide variety of ways (e.g., wearing attire or accessories, applying concealing cosmetics over the affected area(s)). More drastic means of scar concealment, such as plastic surgery, medical skin camouflage, and tattooing, may also be used for the purposes of self- and other-concealment (e.g., Guttridge et al., 2019). Despite the fact that NSSI scar concealment is a likely outcome of NSSI scarring, no study, to our knowledge, has empirically examined the extent of self- and other-scar concealment. Furthermore, no studies have characterized the cognitive and affective correlates of NSSI scar concealment, which may inform clinical directives aimed at treating NSSI.

Individuals with NSSI scarring report their scars hold significant, often emotionally-valenced, meaning (Bachtelle and Pepper, 2015; Burke et al., 2017), and scar concealment practices are likely associated with the scar-related cognitions individuals experience. For example, many individuals believe their scarring is socially detrimental and endorse socially-focused negative emotions (i.e., shame, embarrassment). Others believe NSSI scarring is associated with negative self-beliefs (e.g., “My scars make me feel weak”) and remind individuals of specific affective and contextual factors, including their capability to act on suicidal thoughts (Burke et al., 2017). In contrast, others have endorsed positive beliefs about their scars, including that they represent their physical and emotional strength and serve as sources of hope and pride (Burke et al., 2017). Importantly, negative scar-related cognitions may be significantly associated with individuals’ desire to conceal their scarring from themselves and others as way to reduce self- or public stigma, respectively.

Furthermore, some research suggests that concealing one’s stigmatized status, stigmatized markings, or stigmatized identities is associated with higher levels of affective or internalizing symptomatology (Link et al., 1991; Potoczniak et al., 2007). The association between scar concealment and psychological distress is of particular concern for individuals who engage in NSSI, as this distress may prompt greater NSSI urges and behaviors (e.g., Hasking et al., 2017), thereby facilitating NSSI maintenance.

1.1. The current study

In the current study, we aimed to characterize the occurrence of NSSI self- and other-scar concealment. Further, we aimed to examine cognitive, affective, and self-injury related correlates (i.e., NSSI urges, suicidal thinking) of self- and other-concealment. We hypothesized that scar concealment would be associated with greater negative NSSI scar-specific beliefs and fewer positive NSSI scar-specific beliefs. We also hypothesized that scar concealment would be associated with increased affective symptomatology (i.e., depression, anxiety) and with risk factors for future self-injury (e.g., recent suicidal ideation, NSSI urges) above and beyond prior NSSI severity (i.e., NSSI scarring, medical severity, frequency).

Finally, we aimed to conduct several exploratory analyses. First, we examined whether frequency of self-concealment or other-concealment is more strongly associated with negative NSSI scar-specific beliefs, psychological symptomatology, and risk for future self-injury. Second, we explored the connection between scar concealment and psychological treatment history and preferences, specifically (a) a history of scar-focused NSSI treatment, (b) the desire for such treatment, and (c) the belief that such a treatment could be clinically useful.

2. Method

2.1. Participants

Participants ($n = 505$) were recruited from Amazon’s Mechanical Turk (MTurk) ($Mage = 33.36$, $SD = 8.48$; approximately 42% women; 76% White, 13% Black, 4% Asian, 7% other or Biracial, 81% non-

Hispanic/Latinx). Inclusion criteria for the larger study were ability to read/speak English, location within the United States, having at least a 95% approval rate on all other MTurk jobs, and endorsement of a lifetime history of NSSI. Of the larger study sample, 56.20% ($N = 284$) reported at least one scar from the behavior. For the current study, inclusion criteria were a positive history of NSSI and at least one scar from engaging in NSSI. Although 284 participants met criteria for positive NSSI history with scarring, six participants did not provide complete data. Therefore, 278 participants (see Table 1 for sample descriptives) were included in the current study. There were no significant differences on age ($t = -0.24$, $p = .81$), race ($\chi^2 = 6.96$, $p = .07$) or ethnicity ($\chi^2 = 4.37$, $p = .11$) between the those with a history of scarring (i.e., present sample) and those without (i.e., larger sample). However, there were significantly more women ($\chi^2 = 3.91$, $p = .048$) and more individuals identifying as sexual minorities ($\chi^2 = 10.92$, $p = .001$) in the present sample compared to the larger sample.

Table 1
Study sample descriptive statistics.

	<i>M (SD) except where noted</i>
Age	20.20 (2.64)
Gender (women), <i>n (%)</i>	128 (46)
Sexuality, <i>n (%)</i>	
Heterosexual	201 (72.3)
Homosexual	14 (5.0)
Bisexual	61 (21.9)
Prefer to self-describe	2 (0.7)
Race, <i>n (%)</i>	
White	215 (77.3)
Black	39 (14.0)
Asian	8 (2.9)
Other/biracial	15 (5.4)
Prefer not to answer	1 (0.4)
Scar concealment from self	2.67 (1.56)
Scar concealment from others	3.31 (1.45)
NSSI lifetime # days, <i>n (%)</i>	
0 days	0 (0)
1 day	0 (0)
2–5 days	13 (4.7)
6–20 days	44 (15.8)
20–50 days	59 (21.2)
50+ days	162 (58.3)
NSSI engagement, <i>n (%)</i>	
Past month	179 (64.4)
Past year	217 (78.1)
NSSI lifetime med severity, <i>n (%)</i>	
0	138 (49.6)
1 day	44 (15.8)
2–5 days	50 (18.0)
6–20 days	18 (6.5)
20–50 days	9 (3.2)
50+ days	5 (1.8)
NSSI scar frequency, <i>n (%)</i>	
0 scars	0 (0)
1 scar	47 (16.9)
2–5 scars	157 (56.5)
6–20 scars	51 (18.3)
20–50 scars	13 (4.7)
50+ scars	10 (3.6)
NSSI scar noticeability	3.52 (1.1)
SCS-Weak	7.77 (4.03)
SCS-Reminders	12.13 (4.4)
SCS-Social	13.33 (6.11)
SCS-Suicide	13.96 (7.63)
SCS-Positive	12.50 (6.45)
Depression	20.67 (12.33)
Anxiety	16.73 (12.41)
Past month SI, <i>n (%)</i>	32 (11.5)
Past week NSSI Urges	12.76 (6.14)
NSSI Scar Tx History (Yes), <i>n (%)</i>	144 (51.8)
NSSI Scar Tx Interest	2.59 (1.4)
NSSI Scar Tx Belief	3.30 (1.35)

Note: $N = 278$; NSSI = nonsuicidal self-injury; SCS = scar cognition scale; Tx = treatment.

2.2. Procedure

Participants were recruited through MTurk, an online platform that allows individuals to find and complete various survey tasks posted by researchers. Research has demonstrated that MTurk workers are reliable responders (Buhrmester et al., 2011) and more attentive to study instructions than college student participants (Hauser and Schwarz, 2016). MTurk participants are generally representative of the United States population in terms of demographic characteristics (Huff and Tingley, 2015) as reflected in our larger study sample. The investigation was carried out in accordance with the latest version of the Declaration of Helsinki, all procedures were approved by University of Notre Dame's Institutional Review Board, and informed consent of participants was obtained after the nature of the procedures had been fully explained.

2.3. Measures

NSSI behavior history. A modified version of the Inventory of Statements about Self-Injury Scale (ISAS; Klonsky and Glenn, 2009) was used to assess engagement in NSSI behaviors and associated NSSI characteristics. The ISAS consists of two parts, the first of which assesses characteristics of NSSI engagement (e.g., methods used, recency of behavior, frequency of behavior, experience of pain) and the second assesses NSSI functions. To align with recent re-conceptualizations of the frequency of NSSI behavior (American Psychiatric Association, 2013), the first portion of the ISAS was modified to ask participants about the number of *days* (as opposed to the number of acts) they have engaged in NSSI throughout their lifetime. An additional item was added at the end of the ISAS to assess the medical severity of NSSI behavior. Due to the variability in reported number of lifetime NSSI days and frequency of lifetime NSSI medical attention, we categorized frequency to reduce variability in responses (0, 1, 2–5, 6–20, 21–50, and 51+).

Presence, number and perceived noticeability of NSSI scars. In the current study, participants were asked whether NSSI ever resulted in a scar or permanent mark with the question, “Do you currently have any scars or permanent marks from hurting yourself on purpose without trying to die?” (Yes/No). If participants endorsed “yes” then they were asked a follow-up question to assess the number of scars or marks secondary to NSSI: “How many scars or permanent marks do you have from hurting yourself on purpose without trying to die?” We minimized the variability observed in scar number by categorizing number of scars into five categories (1, 2–5, 6–20, 21–50, and 51+ NSSI scars). To assess perceived noticeability of NSSI scars, participants were asked “Would your scars be noticeable to other people if the affected area(s) were showing?” (0 = *Not noticeable at all*, 4 = *Very noticeable*).

Scar concealment. We developed two items to assess scar concealment from self and others. Participants were asked, “Do you try to hide these scars or marks from yourself?” and “Do you try to hide these scars or marks from other people?” Participants were instructed to respond using a 5-point Likert scale from 0 (*Not at all*) to 4 (*Very often*).

Scar-related cognitions. The Nonsuicidal Self-Injury Scar Cognition Scale (NSSI-SCS; Burke et al., 2017) is a 23-item self-report measure that assesses NSSI scar-related cognitions, which are summed into five subscales: reminder, social, positive, weak, and suicide. All items are answered on a Likert scale ranging from 1 (*Very slightly or not at all*) to 5 (*Extremely*) and initial psychometric properties have been established (Burke et al., 2017). The SCS-Weak subscale assesses negative self-evaluative beliefs due to scarring. The SCS-Reminders subscale assesses cognitions that one's scars serve as reminders of past negative experiences. The SCS-Social subscale assesses individuals' scar-related socially-motivated cognitions, such as experiencing embarrassment and beliefs that others judge them. The SCS-Suicide subscale assesses individuals' beliefs that their scarring contributes to their suicidal ideation and capability. The SCS-Positive subscale assesses individuals' positive scar beliefs (e.g., source of hope/pride; demonstrating physical/emotional strength). In the current study, the reliability of the

subscales ranged from good to excellent: SCS-Weak ($\alpha = 0.90$), SCS-Reminders ($\alpha = 0.81$), SCS-Social ($\alpha = 0.91$), SCS-Suicide ($\alpha = 0.93$), SCS-Positive ($\alpha = 0.92$).

Depressive and anxiety symptomatology. The Depression Anxiety Stress Scale (DASS-21; Henry and Crawford, 2005) is a 21-item self-report measure that is commonly used to assess symptoms of depression, anxiety, and stress over the past week. Prior research has demonstrated good psychometric properties for this measure (Henry and Crawford, 2005). The current study utilized the depression and anxiety subscales, which both demonstrated excellent reliability ($\alpha = 0.92$ and $\alpha = 0.92$, respectively).

Suicidal ideation. We used two items from the Self-Injurious Thoughts and Behavior Interview (Nock et al., 2007) to assess for suicidal ideation. Participants who endorsed a lifetime history of suicidal ideation were asked to report on the last time they experienced suicidal ideation. For the current study, we used a dichotomous variable of past month history of suicidal ideation to increase consistency in timeline across study variables.

NSSI urges. The Alexian Brothers Urges to Self-Injure Scale (ABUSI; Washburn et al., 2010); is a 5-item self-report measure that assesses past week urges to engage in NSSI. Each item has a variable response scale, assessing severity and length of urges, as well as difficulty resisting NSSI urges, all of which have been positively associated with engagement in NSSI behavior (Washburn et al., 2010). This measure has demonstrated strong psychometric properties (Washburn et al., 2010). In the current sample, the scale demonstrated excellent reliability ($\alpha = 0.93$).

NSSI scar-specific treatment history and interest. Items were developed to assess NSSI scar-specific treatment variables. To assess treatment history, participants were asked, “Have you ever seen a mental health specialist in part due to your experiences related to your self-injury scarring?” (Yes/No). To assess desire for treatment, participants were asked, “How often do you experience related to your self-injury scarring result in you wanting to seek treatment from a mental health specialist?” (0, *Never* to 4, *Often*). To assess beliefs regarding scar-specific treatments, participants were asked, “How helpful do you think it would be if mental health treatments for self-injury included specific strategies for managing experiences associated with self-injury scarring?” (0, *Not at all* to 4, *Very much*).

2.4. Data analytic plan

Data was first examined to ensure attentive and valid responding. The larger study included six attention check items (i.e., ‘Select 3 on this item’), of which participants had to pass four of the six items to be included in the present sample. Further, survey duration was examined and responses completed at a rate of less than 20 s per survey question or greater than three standard deviations beyond the mean survey completion time were considered invalid responses. Ten participants were removed prior to analysis (i.e., not considered in the final sample) due to inattentive or invalid responding.

We examined whether the degrees of scar concealment from self and others were associated with demographic variables and NSSI severity characteristics using chi-square comparisons (categorical variables) and correlations (continuous variables). We recoded sexual orientation into a dichotomous variable (heterosexual versus not heterosexual) due to the small cell counts for non-heterosexual orientations. Only individuals identifying as a man or woman were included due to the small cell counts for other gender identities (e.g., non-binary, transgender) ($n = 2$).

To evaluate the study's first and second hypotheses, a series of linear and binary logistic regressions were conducted to determine whether the degrees of scar concealment from self and others were associated with scar cognitions and symptomatology, after accounting for NSSI severity indices. Tests of these hypotheses were conducted using Bonferroni adjusted alpha levels of 0.0028 per test (0.05/18).

To carry out our study's exploratory aims, we first selected outcomes demonstrating significant associations in our primary analyses. Then,

using R package cocur, we conducted Zou (2007) confidence interval test to determine if correlations between scar concealment from self and outcomes measures differed significantly from correlations between scar concealment from others and outcome measures (Diedenhofen and Musch, 2015; Zou, 2007). Confidence intervals not containing zero were interpreted as statistically significant. Finally, we conducted linear or binary logistic regressions to evaluate whether scar concealment from the self and others were associated with NSSI scar-specific treatment variables.

3. Results

3.1. Preliminary analyses

Among those with a history of scarring, 79.5% ($n = 221$) endorsed concealing their scarring from others and 63.7% ($n = 177$) endorsed concealed their scarring from themselves at least sometimes. Furthermore, a majority, 62.6% ($n = 174$) endorsed concealing their scarring from themselves and others at least sometimes, 16.9% ($n = 47$) endorsed concealing their scarring only from others (and not themselves), at least sometimes, and only 1.01% ($n = 3$) endorsed only concealing their scarring from themselves (and not others).

Gender, age, and sexual orientation were not significantly associated with scar concealment from the self or others. However, Hispanic individuals were significantly more likely to conceal their scarring from themselves ($t(271) = 5.98, p < .001$) and from others ($t(271) = 2.82, p = .001$) as compared to non-Hispanic individuals, and Black individuals were significantly more likely to conceal their scarring from themselves as compared to White individuals ($F(3,273) = 6.28, p < .001$).

In terms of NSSI severity characteristics, there were no statistically significant associations between number of NSSI scars, lifetime frequency of NSSI (days), and concealment from self or others (p 's = 0.119–0.755). However, scar concealment from the self and from others was significantly correlated with scar noticeability ($r = 0.342, p < .000$; $r = 0.503, p < .000$) and NSSI medical severity ($r = 0.396, p < .000$; $r = 0.234, p < .000$), respectively, and thus these factors were covaried in primary analyses.

3.2. Primary analyses

See Table 2 for correlations between primary study variables. The degree to which individuals attempt to conceal their NSSI scarring from themselves was significantly positively associated with all scar-related cognition subscales (SCS-Weak, SCS-Reminders, SCS-Social, SCS-Suicide, and SCS-Positive), after accounting for NSSI scar noticeability and NSSI medical severity (Table 3). Findings were replicated in relation to the degree to which individuals attempt to conceal their NSSI scarring from others, except for the SCS-Positive subscale, which was unrelated to concealment from others (Table 4).¹

The degree to which individuals attempt to conceal their NSSI scarring from themselves was significantly positively associated with depressive and anxiety symptomatology, and with recent NSSI urge severity, after controlling for NSSI scar noticeability and NSSI medical severity (Table 3). Findings were replicated in relation to the degree to which individuals attempt to conceal their NSSI scarring from others, except for recent NSSI urge severity, which was no longer significant after applying the Bonferroni correction ($p = .003$) (Table 4).

Exploratory Aims. There were significant differences in the strength of relationships between scar concealment from the self and others in their relationships with SCS-Weak (Zou's CI: 0.12–0.29), SCS-Social (Zou's CI: 0.07–0.22), SCS-Suicide (Zou's CI: 0.19–0.37), SCS-Positive

(Zou's CI: 0.19–0.38), anxiety symptomatology (Zou's CI: 0.17–0.35), and recent NSSI urge severity (Zou's CI: 0.07–0.26), such that self-concealment evidenced stronger relationships with these cognitive, affective, and behavioral variables as compared to other-concealment. There were no significant differences between scar concealment from the self and others in the strength of their relationships with depressive symptomatology (Zou's CI: 0.03 – 0.17) and SCS-Reminder (Zou's CI: 0.02 – 0.16). See Table 2 for correlations.

The degree to which individuals attempt to conceal their NSSI scarring from themselves and others was significantly negatively associated with likelihood of having received treatment in the past, and positively associated with desire to attain NSSI scar-specific treatment, and belief that a scar-specific treatment would be useful (Table 5).

4. Discussion

Consistent with previous narrative studies, clinical case reports, and online forum content (Chandler, 2014; Gutridge et al., 2019; Lewis and Mehrabkhani, 2016; Welch et al., 1999), the current findings empirically demonstrate that scar concealment from others is highly common. The current findings extend prior literature further by providing evidence that scar concealment from the self is also common. Notably, the majority of individuals with NSSI scarring endorse concealing their scarring from both others and the self, at least some of the time. Although frequency of scar concealment from the self and others are both significantly associated with negative NSSI scar-specific beliefs and psychological distress, concealment from the self was more strongly associated with these variables.

Our results demonstrate cognitive correlates of scar concealment. We found that scar concealment is significantly associated with the experience of negative beliefs about NSSI scarring. It is possible that scar-related social cognitions (e.g., embarrassment, fear of judgement) and negative self-evaluative beliefs may be reinforced over time, as concealment prevents opportunities for disconfirmation of these beliefs. Similarly, scar concealment may also be maintained via avoidance due to fear of triggering memories of past stressful experiences. This is supported by findings that greater scar concealment from the self and from others is associated with believing scars serve as visual reminders of past stressful experiences. Although there were no significant associations between concealment and past month suicidal ideation, scar concealment from others and, particularly, the self, was associated with suicide-related scar cognitions (e.g., scars promoting suicidal desire). It may be that individuals who endorse these cognitions engage in concealment practices in hopes that avoiding scar stimuli will reduce their suicide risk. However, it is also possible that concealment may indirectly increase suicidality, given associations between concealment and increased anxiety and depressive symptomatology. Future longitudinal work is needed to ascertain the direction of these relationships. Notably, contrary to study hypotheses, scar concealment from others was unrelated to positive scar beliefs, and scar concealment from the self was significantly positively associated with positive scar beliefs. Prior research suggests that individuals rarely experience positive scar cognitions alone, and instead these positive cognitions often coexist with negative cognitions (Bachtelle and Pepper, 2015; Burke et al., 2017), which may help contextualize this counterintuitive finding.

We also found that individuals who endorse greater self- and other-scar concealment experience significantly greater affective symptoms and that those who endorse greater self-concealment report greater NSSI urge severity, even after accounting for NSSI severity indices. Findings are consistent with literature on stigmatized identities, suggesting that greater degree of *outness* is generally associated with less psychological distress (Morris et al., 2001; Quinn et al., 2014; Vyavaharkar et al., 2011). It is possible that concealment increases negative scar beliefs, depression, and anxiety, which in turn, increase the urge to regulate these aversive cognitive and affective experiences via self-injury. Alternatively, it is possible that greater NSSI urges may lead

¹ Primary study analyses were run covarying for race and ethnicity and findings remain consistent. The models are presented without these correlates in Tables 3–4 to enhance interpretability.

Table 2
Correlations with confidence intervals.

Variable	1	2	3	4	5	6	7	8	9
1. Scar concealment from self									
2. Scar concealment from others	.58 [.49, .65]								
3. SCS-Weak	.69 [.63, .75]	.49 [.40, .57]							
4. SCS-Reminder	.55 [.46, .63]	.48 [.39, .57]	.69 [.62, .75]						
5. SCS-Social	.72 [.66, .77]	.58 [.49, .65]	.83 [.79, .87]	.70 [.63, .75]					
6. SCS-Suicide	.66 [.59, .72]	.39 [.28, .48]	.77 [.71, .81]	.58 [.50, .65]	.76 [.71, .81]				
7. SCS-Positive	.51 [.42, .59]	.23 [.11, .34]	.59 [.51, .66]	.55 [.46, .63]	.54 [.45, .62]	.83 [.79, .86]			
8. DASS-Depression	.44 [.34, .53]	.37 [.27, .47]	.59 [.50, .66]	.42 [.32, .52]	.55 [.46, .63]	.54 [.45, .62]	.36 [.26, .46]		
9. DASS-Anxiety	.64 [.56, .70]	.38 [.27, .47]	.69 [.62, .75]	.52 [.43, .60]	.68 [.62, .74]	.74 [.69, .79]	.64 [.56, .70]	.74 [.69, .79]	
10. ABUSI Tot	.48 [.38, .56]	.31 [.20, .41]	.54 [.46, .62]	.38 [.28, .48]	.54 [.45, .62]	.59 [.51, .66]	.51 [.42, .60]	.56 [.47, .63]	.59 [.51, .66]

Note. Values in square brackets indicate the 95% confidence interval for each correlation. The confidence interval is a plausible range of population correlations that could have caused the sample correlation.

Table 3
Scar concealment from the self predicting scar cognitions, internalizing symptomatology, NSSI urges, and suicidal ideation, controlling for scar noticeability and NSSI medical severity.

	Dependent variable								
	SCS-Weak	SCS-Reminder	SCS-Social	SCS-Suicide	SCS-Positive	DASS Depression	DASS Anxiety	ABUSI Tot	Past month SI
Scar concealment from self	1.564***	1.230***	2.343***	2.434***	1.385***	3.209***	4.462***	1.622***	-0.035
Scar noticeability	0.180	0.493**	0.845***	0.671**	0.217	0.010	-0.327	0.458	0.438**
NSSI medical severity	0.519***	0.464**	0.909***	1.860***	1.776***	1.250**	2.208***	0.499*	-0.374*
Constant	2.442***	6.598***	3.143***	3.172***	6.144***	10.595***	3.475*	6.264***	-3.219***
Observations	264	264	264	264	264	264	264	264	264
R ²	0.494	0.315	0.580	0.522	0.345	0.218	0.445	0.247	
Adjusted R ²	0.488	0.307	0.575	0.517	0.337	0.209	0.439	0.238	
LL									-91.487
AIC									190.973
Residual Std. Error	2.892	3.659	3.993	5.300	5.229	11.081	9.344	5.371	
F Statistic (df = 3; 260)	84.489***	39.891***	119.611***	94.786***	45.628***	24.097***	69.565***	28.420***	

Note: *p < 0.05; **p < 0.01; ***p < 0.001; NSSI = nonsuicidal self-injury; SCS = scar cognition scale; SI = suicidal ideation; LL = Log Likelihood; AIC = Akaike Information Criterion; unstandardized estimates are presented.

individuals to conceal their scarring more (perhaps particularly from oneself) as a way to reduce visual reminders that they could act (or have acted in the past) on this urge. However, our study did not assess directionality, and future longitudinal research is needed to disentangle the temporality of these relationships. Of note, contrary to study hypotheses and previous findings (Burke et al., 2016), the association between scar concealment and recent suicidal ideation was not significant; however, due to the relatively small number of participants who endorsed past month suicidal ideation in our sample, it is likely that we were restricted in our ability to detect a signal.

Participants identifying as Hispanic and/or African American were significantly more likely to engage in scar concealment behaviors than

participants identifying as non-Hispanic or White, respectively. Although NSSI public- and/or self-stigma may be stronger for racial and ethnic minorities, influencing concealment practices, there are mixed findings. Some studies suggest greater levels of mental health-related stigma and others suggest lower or equivalent stigma levels compared to White individuals (e.g., Brown et al., 2010; Conner et al., 2009; Rao et al., 2007; Wong et al., 2012), thus future research is needed.

In our exploratory analyses, almost half of individuals with NSSI scarring engaged in psychological treatment that focused, at least in part, on their experiences related to their scarring. Notably, degree of other- and self-concealment were negatively associated with a history of such treatment; nevertheless, individuals reported interest in and

Table 4

Scar concealment from others predicting scar cognitions, internalizing symptomatology, NSSI urges, and suicidal ideation, controlling for scar noticeability and NSSI medical severity.

	Dependent variable								
	SCS-Weak	SCS-Reminder	SCS-Social	SCS-Suicide	SCS-Positive	DASS Depression	DASS Anxiety	ABUSI Tot	Past month SI
Scar concealment from others	1.115***	1.181***	1.897***	1.092***	0.187	3.174***	2.562***	0.858***	0.096
Scar noticeability	0.046	0.201	0.506*	0.858**	0.589	-0.808	-0.328	0.503	0.369*
NSSI medical severity	1.011***	0.812***	1.618***	2.709***	2.315***	2.146***	3.693***	1.048***	-0.405**
Constant	2.876***	6.631***	3.565***	4.502***	7.342***	10.589***	5.345**	7.019***	-3.362***
Observations	264	264	264	264	264	264	264	264	264
R ²	0.329	0.280	0.453	0.361	0.258	0.193	0.269	0.146	
Adjusted R ²	0.321	0.272	0.446	0.354	0.249	0.184	0.260	0.136	
LL									-91.317
AIC									190.633
Residual Std. Error	3.329	3.752	4.558	6.129	5.565	11.251	10.728	5.721	
F Statistic (df = 3; 260)	42.500***	33.689***	71.648***	49.019***	30.138***	20.775***	31.834***	14.768***	

Note: *p < 0.05; **p < 0.01; ***p < 0.001; NSSI = nonsuicidal self-injury; SCS = scar cognition scale; SI = suicidal ideation; LL = Log Likelihood; AIC = Akaike Information Criterion; unstandardized estimates are presented.

Table 5

Scar concealment predicting treatment history, desire, and beliefs.

	Dependent variable					
	Treatment Hx	Desire for Tx	Belief Tx Useful	Treatment Hx	Desire for Tx	Belief Tx Useful
Scar concealment from self	-0.634***	0.540***	0.348***			
Scar concealment from others				-0.605***	0.491***	0.305***
Constant	1.584***	1.149***	2.373***	1.944***	0.968***	2.291***
Observations	278	278	278	278	278	278
R ²		0.367	0.162		0.262	0.108
Adjusted R ²		0.365	0.159		0.259	0.104
LL	-164.141			-169.603		
AIC	332.283			343.206		
Residual Std. Error		1.112	1.241		1.201	1.280
F Statistic (df = 1; 276)		159.992***	53.216***		97.736***	33.286***

Note: *p < 0.05; **p < 0.01; ***p < 0.001. LL = Log Likelihood; AIC = Akaike Information Criterion; Treatment hx coded 1 = yes, 2 = no; Hx = history; Tx = treatment; unstandardized estimates are presented.

believed that a treatment focused on NSSI scarring would be useful. Thus, psychological interventions directly targeting NSSI scarring may not only be sought after, but also may aid in NSSI remission.

4.1. Clinical implications

This study yields key clinical implications that may inform the assessment of NSSI, as well as the development of evidence-based NSSI scar specific interventions. First, given the study findings, which highlight a relationship between scar concealment and psychological distress, mental health providers should strongly consider assessing for NSSI scarring and concealment practices among those with a history of NSSI. Such information may provide unique insight into an individual's psychological distress and potentially, their risk for continued NSSI engagement.

When assessing scar concealment practices, it will be important for clinicians to evaluate the functions for concealment to determine useful therapeutic interventions. Indeed, participants in our study indicated interest in receiving NSSI scar-specific treatment and believed that a scar-specific treatment would be useful. Our findings suggest that those who conceal their scarring, especially from themselves, experience negative scar-specific beliefs. Using cognitive restructuring techniques may be beneficial to assist individuals with developing more balanced beliefs regarding their history of NSSI and their present scarring. Indeed,

research suggests that helping individuals to reattribute negative cognitive and affective experiences to the process of concealing stigmatized markings may decrease the associated psychological burden and distress (Miller and Major, 2000). For individuals who conceal their scarring to avoid aversive memories, graduated exposures may be effective to increase tolerance towards and coping with these stressful memories. Furthermore, for individuals experiencing shame or negative affect related to their scarring, acceptance and mindfulness strategies may be particularly helpful in reducing related psychological distress (Lillis et al., 2009).

4.2. Strengths & limitations

This study has several limitations that are important to consider. First, this study was cross-sectional, which precludes our ability to make causal claims; longitudinal research is necessary to determine the directionality of all examined relationships. Second, we used retrospective self-report measures with varying time scales. Future studies may benefit from incorporating reports from clinicians or close others to provide information complementary to self-report. Third, the current study utilized an online sample of individuals recruited through MTurk, and these individuals may not be representative of a clinical population. Replication using clinical samples is necessary to inform the understanding of scar concealment practices in individuals with greater

clinical severity. Finally, there are a number of variables that may account for scar concealment patterns that we did not explore in the present study. For example, individuals' prior experiences with others seeing and/or commenting on their scarring, the outcomes of prior NSSI-related disclosure (e.g., Hasking et al., 2015), and NSSI recovery status (Lewis et al., 2019) likely impact both scar cognitions and concealment practices, as well as associated distress, and thus warrant future investigation. In spite of these limitations, by recruiting a large sample of individuals with NSSI scarring, a hard-to-reach population, this study represents the first to characterize the occurrence of NSSI scar concealment and provides clinically useful findings on its cognitive, affective, and self-injury risk correlates.

Authorship statement

Taylor A. Burke: Conceptualization, Methodology, Formal analysis, Writing- Original draft preparation, Writing- Review & Editing. **Brooke A. Ammerman:** Conceptualization, Methodology, Project administration, Writing- Original draft preparation, Writing- Review & Editing. **Jessica L. Hamilton:** Conceptualization, Writing- Review & Editing. **Jonathan P. Stange:** Conceptualization, Writing- Review & Editing. **Marilyn Piccirillo:** Conceptualization, Writing- Review & Editing.

Declaration of competing interest

None.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jpsychires.2020.07.040>.

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