

Initial Psychometric Validation of the Non-Suicidal Self-Injury Scar Cognition Scale

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Abstract Given the growing literature on the detrimental psychological consequences of NSSI, it is surprising that scarce research has focused on the permanent physical consequences of NSSI, scarring to one's tissue (Burke et al. *Psychiatry Research* 228, 416–424, 2015; Lewis *The Journal of Nervous and Mental Disease*, 204(1), 33–35 2016). Indeed, with recent research suggesting that upwards of half of those with a history of NSSI bear scarring as a result of the behavior (Burke et al. *Comprehensive Psychiatry*, 65, 79–87 2016), the psychological implications of scarring are important to understand. Given preliminary literature suggesting that the vast majority of individuals who bear NSSI scars ascribe a great deal of meaning to their scarring, and that this meaning varies widely, a psychometrically sound scale is needed to comprehensively and systematically assess NSSI scar-related cognitions. The present study examined the psychometric properties of the Non-Suicidal Self-Injury Scar Cognition Scale (NSSI-SCS). A sample of 110 undergraduates with at least one scar from NSSI completed the NSSI-SCS as well as measures of concurrent and divergent validity. Exploratory Factor Analysis was conducted to determine the factor structure of the NSSI-SCS. Results indicated that a five-factor solution offered the best fit for the data. Psychometric analyses support the validity of the NSSI-SCS given evidence of concurrent validity, divergent validity, and reliability. Future research should examine the test-retest reliability of the NSSI-SCS, as well as its sensitivity to change, particularly in the context of treatment research.

Keywords Non-suicidal self-injury · Scars · Cognition · Suicidal ideation · Social anxiety · Depression

Non-suicidal self-injury (NSSI) is defined as the deliberate self-destruction of one's tissue, engaged in without any associated lethal intent (Nock et al. 2006). Common NSSI methods include, but are not limited to, self-cutting, self-burning, and self-hitting (Nock 2010). Lifetime NSSI prevalence rates are remarkably high among young adults (Whitlock et al. 2013; Gratz et al. 2002). As such, research on risk factors for NSSI has burgeoned over the past several decades, finding strong evidence that the behavior is both cross-sectionally associated with and longitudinally predicted by significant mental health problems (for a review, see Fox et al. 2015). NSSI is not only a result of negative psychological circumstances, but also is a prospective predictor of negative psychological outcomes (Burke et al. 2015a; Lundh et al. 2011a, b). Most importantly perhaps, NSSI is documented as one of the most robust prospective predictors of suicidal thoughts and behaviors (for a review, see Hamza et al. 2012).

Given the growing literature on the detrimental psychological consequences of NSSI, it is surprising that scarce research has focused on the permanent physical consequences of NSSI, scarring to one's tissue (Burke et al. 2016; Lewis 2016). Indeed, with recent research suggesting that upwards of half of those with a history of NSSI bear scarring as a result of the behavior (Burke et al. 2016), the psychological implications of scarring are important to understand. It is possible that scarring from NSSI is stigmatizing, given that others may view self-inflicted scarring as a physical manifestation of mental illness. Furthermore, those with scarring may perceive the remnants of previous acts of NSSI to be unattractive, thereby affecting their self-esteem. Moreover, it is also likely that the scars cue memories of painful life experiences, thus

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maintaining the psychological distress that may have led to the self-injurious act in the first place. Despite the theorized impact of physical scarring on people who bear NSSI scars, to our knowledge, only three studies have directly and empirically examined psychological correlates of NSSI scarring. Dyer et al. (2013) found that among females, those with NSSI scarring exhibited a significantly more negative body image than those with scars of alternate origins, even after controlling for scar characteristics (e.g., size, appearance), borderline personality symptoms, and body mass index. These results have been replicated among men (Dyer et al. 2015). More recently, Burke et al. (2016) found that the presence and number of NSSI scars were significantly associated with current suicidal ideation, after controlling for depressive symptoms, suicide attempt history, NSSI method, NSSI medical severity, and NSSI frequency.

Similarly, only two studies have examined cognitions related to one's NSSI scarring (Bachtelle and Pepper 2015; Lewis and Mehrabkhani 2015), which are likely inextricably linked to the psychological correlates associated with scarring. Lewis and Mehrabkhani (2015) utilized publicly available dialogue in NSSI online communities to conduct a thematic analysis of how individuals view their NSSI scars. Reviewing a total of 53 posts written by 52 unique persons, the authors reported that there is a wide variety in the ways in which individuals perceive and relate to their NSSI scars. The analysis revealed four main themes of NSSI scar perceptions: (1) scarring as part of self-narrative, either with a positive connotation (i.e., as a symbol of strength, as evidence of overcoming difficulties) or with a negative connotation (i.e., as a source of shame that is visible to others); (2) scar non-acceptance (i.e., expressing hate towards one's scars, shame or disgust related to scarring, and feeling unattractive due to scarring); (3) acceptance as a process (reflecting that a faction of individuals endorse that it has taken a significant amount of time to accept one's scarring, often hindered by the experience of scar-related shame); and, (4) ambivalence toward scarring (e.g., simultaneously experiencing scar-related pride and shame).

Reporting interpretations of NSSI scarring in line with this thematic analysis, Bachtelle and Pepper (2015) conducted a study of 49 undergraduates with NSSI scarring. Using measures created for this study, the authors found that individuals who endorsed 'personal growth' (akin to Lewis and Mehrabkhani (2015)'s self-narrative theme) due to their NSSI scarring were less likely to report scar-related shame, self-disgust, self-injury-related regret, and scar-related regret, and had lower levels of self-reported future likelihood of engaging in NSSI. Individuals bearing NSSI scars who reported high levels of scar-related shame reported a higher likelihood of future NSSI, greater self-disgust, and greater scar-related regret (Bachtelle and Pepper 2015). Clinically, individuals who were high on levels of scar-related shame also reported

higher levels of depressive and borderline personality symptomatology (Bachtelle and Pepper 2015).

Given preliminary literature suggesting that the vast majority of individuals who bear NSSI scars ascribe varying meaning to their scarring (Bachtelle and Pepper 2015; Lewis and Mehrabkhani 2015), a psychometrically sound scale is needed to comprehensively and systematically assess NSSI scar-related cognitions. Better understanding how people cognitively appraise their NSSI scars and, in turn, being able to examine the psychological correlates of these perceptions, may significantly influence NSSI prevention and intervention development.

Although Bachtelle and Pepper (2015) designed measures to assess perceptions of scarring, their scales exhibited several limitations. The authors designed a scar-related growth subscale (e.g., "Do you view your scar as part of your identity, who you are today") and a shame subscale (e.g., "When you reflect on your self-injury scar, how often do you feel regret"), which comprise three and six items, respectively scored on a 5-point Likert scale. Although the shame subscale exhibited good reliability ($\alpha = .90$), the growth subscale exhibited low reliability ($\alpha = 0.60$), perhaps due to the small number of items. In addition, they administered a seven-item dichotomous questionnaire assessing attributed meanings to self-injury scars (e.g., "Is your self-injury scar ever a...marker of stigma or shame?") that asks participants to respond yes or no to each proposed meaning. Given the restricted range of questions (a total of 16, seven of which are scored dichotomously), as well as the lack of exploratory factor analysis to create the growth and shame subscales, the scales used in this study are limited in their ability to detect all potential factors underlying one's interpretive meaning of their scarring.

Furthermore, a recently published psychometric analysis of an extensive scale designed primarily to assess the occurrence and frequency of a range of methods of NSSI, included three dichotomous prompts regarding scar-related cognitions (Non-Suicidal Self-Injury-Assessment Tool (NSSI-AT); Whitlock et al. 2014). A factor analysis of the tool resulted in a factor entitled, "Ambivalence" based on four items, three of which include prompts related to NSSI scarring: "The lasting marks/scars are constant reminders of a bad/rough time," "My scars are my battle wounds—I made it through," and "The remaining marks/scars are a source of embarrassment for me." The ambivalence subscale evidenced an alpha of .57. Of note, this scale only was administered to individuals who reported a history of NSSI but who no longer self-injured, and thus, we cannot be sure that the scar cognitions assessed in this measure would generalize to a population of current or recent self-injurers.

Based on the field's lack of a psychometrically sound tool to assess NSSI scar-related cognitions, the current study aimed to develop an extensive self-report scale to comprehensively assess the hypothesized widely varying cognitions related to

one's NSSI scarring. The scale was created to assess *current* cognitions related to scarring, so as to be able to derive meaningful conclusions regarding associations with current clinical symptoms.

NSSI Scar Cognition Scale: Item Generation

Items within four content domains were generated based on clinical literature, online community discussion regarding scarring secondary to NSSI, and extant theory. Recent empirical evidence published after the creation of the NSSI Scar Cognition Scale has bolstered support for the items generated (Bachtelle and Pepper 2015; Lewis and Mehrabkhani 2015).

Social Cognitions Perhaps the most salient theme related to NSSI scarring in the current literature, as well as in online NSSI community discussion, is the notion that one's NSSI scarring is experienced as a source of stigma. Hodgson (2004) reported that some individuals with NSSI scarring report attempting to hide their scars from others through covering up scarred body parts and through developing stories to explain scar origins. In addition, Hodgson (2004) reported that some individuals avoid engaging in activities in which a risk is posed that others may view their scars, such as pursuing relationships. Additionally, Chandler (2014) similarly found that some individuals were deeply concerned about their scarring, divulging that they actively hide their scars. Moreover, several clinical case reports have cited efforts of individuals with scarring from self-inflicted injuries to have them surgically removed, given concerns about the scars serving as sources of stigma and embarrassment (Welch et al. 1999). Other studies have provided evidence that individuals engaging in NSSI utilize online community message boards in order to share and/or obtain information about anxiety regarding NSSI scar exposure and concealment strategies (Lewis and Baker 2011; Whitlock et al. 2006). Supporting these findings, Bachtelle and Pepper (2015) found that 60.4% of those with NSSI scarring believe that the scarring serves as a "marker of stigma or shame." Furthermore, two of the four major themes identified in a systematic thematic analysis of online community dialogue about NSSI scarring support the major role that perceived stigmatization plays for those bearing NSSI scars, particularly in a social context (Lewis and Mehrabkhani 2015). Thus, items for the NSSI Scar Cognition Scale were developed to attain an understanding of the stigma-based and socially-relevant cognitions individuals experience in relation to their scarring (see Appendix 1).

Reminder Cognitions Another theme identified in self-injury literature is that NSSI scars serve as physical reminders of past negative experiences. This theme is supported by literature examining the effects of permanent marks from intimate

partner violence (IPV). It has been found that the association between body image distress and post-traumatic stress disorder (PTSD) is amplified among those with scarring from IPV compared to those without scarring. The authors hypothesized that given that PTSD symptoms include biased attention to stimuli serving as reminders of a trauma, the permanent markings left as a result of the IPV may serve as a physical reminder of the trauma, thus amplifying symptoms (Weaver et al. 2007). It is possible that NSSI scars may similarly activate memories of what initially served as their cause. Given empirical evidence suggesting that a primary function of NSSI is to reduce the experience of highly negative emotions (Nock and Prinstein 2004), observing one's NSSI scar(s) might trigger the retrieval of aversive memories of the intrapersonal or interpersonal events that encouraged one's NSSI episode. Supporting the generalizability of this postulation, in a recent study, a total of 20% of remitted self-injurers acknowledged feeling that "the lasting marks/scars are constant reminders of a bad/rough time" (Whitlock et al. 2014). Given the theoretical plausibility and initial empirical evidence suggesting that NSSI scarring may serve as a trigger in reminding individuals about prior negative experiences, a range of items was included in the scale to reflect cognitive appraisals of one's scarring as serving as painful reminders.

Suicide Cognitions Despite no extant literature directly linking one's cognitions about their NSSI scarring to suicidal thoughts, given the robust association between NSSI and subsequent suicidal behavior, several items were generated to explore whether individuals perceive a connection between their NSSI scarring and suicidal thoughts. We hypothesized that the presence of *permanent* scars, markings that may be accompanied by social stigma and that may not be removable without great difficulty, may instigate an experience of hopelessness, which, in turn, may trigger a desire for suicide (Beck et al. 1985). As a result, several items were generated to assess the relation between one's NSSI scarring and hopelessness.

Perhaps the most prominent theory linking NSSI and suicide is the interpersonal psychological theory of suicide (IPT; Joiner 2005). The IPT suggests that in order to engage in suicidal behavior, one must not only exhibit a desire for suicide, but also an acquired capability for suicide. Acquired capability is defined as having habituated to the pain and fear associated with death. The theory denotes that acquired capability may be attained through exposure to painful and provocative events (Joiner 2005). Perhaps viewing one's NSSI scars may serve as a frequently experienced provocative event, in that it may instigate the experience of painful memories. Furthermore, we hypothesized that viewing one's scarring from self-directed injury may serve to bolster one's confidence that one could enact lethal self-harm in the future if so desired. Therefore, two items were included to assess the extent to which one's NSSI scars make them feel more able to

enact lethal self-injury and feel less afraid of dying. These items were derived by adapting language from the Acquired Capability for Suicide Scale (ACSS; Van Orden et al. 2008), an assessment tool created to measure the IPTS' construct of acquired capability.

Positive Cognitions Clinical and empirical literature, as well as online community discussion regarding self-harm, reflect that some individuals may experience positive cognitions related to their NSSI scarring. Indeed, Bachtelle and Pepper found that 43.8% of individuals indicated that their scarring is a “reminder of overcoming adversity” and 35.4% indicated that their scarring is a “marker of strength.” Furthermore, Lewis and Mehrabkhani (2015) found that one of the four major themes identified in their thematic analysis of an online community discussion board was one of scarring being part of one's self-narrative, which for some is associated with a positive connotation regarding one's ability to overcome difficulties, with NSSI scars serving as a symbol of strength. Thus, we included a range of items reflecting such positive perceptions of one's NSSI scarring.

We hypothesized that a factor analysis of the 26 generated items would result in the emergence of a four-factor scale, including a social cognition factor, a reminder cognition factor, a suicide cognition factor, and a positive cognition factor. We further hypothesized that these factors would exhibit strong construct validity through being correlated with measures of like constructs (i.e. concurrent validity). Specifically, we hypothesized that the social cognition factor would positively correlate with social anxiety symptoms, the reminder cognition factor would positively correlate with social anxiety and depressive symptoms, and the suicide cognition factor would positively correlate with a measure of suicidal ideation and a measure of acquired capability for suicide. We additionally hypothesized that the positive cognition subscale would negatively correlate with symptoms of depression, social anxiety, and suicidal ideation. Given recent research suggesting that shame related to NSSI scarring is positively correlated with endorsing intrapersonal functions of NSSI (i.e., affect regulation, self punishment), we hypothesized that the social cognition factor would be positively correlated with intrapersonal NSSI functions (Bachtelle and Pepper 2015). Similarly, given research suggesting that a perception of one's scarring as representing one's identity and of being a badge of honor ('growth' scale; Bachtelle and Pepper 2015) is related to interpersonal functions of NSSI, we additionally hypothesized that the positive cognition factor would

positively correlate with interpersonal functions of NSSI (i.e., interpersonal influence, autonomy).

In order to further demonstrate the hypothesized subscales' construct validity, we also aimed to demonstrate that the subscales were uncorrelated with measures of unlike constructs. We hypothesized that the SCS subscales would demonstrate divergent validity through being uncorrelated with measures of emotional abuse and stress reactive rumination. We examined childhood emotional abuse as a measure of divergent validity because although we hypothesized that a large proportion of individuals in our self-injuring sample would have a history of childhood emotional abuse, given ample literature in the field suggesting a significant relationship between these constructs (e.g., Buser and Hackney 2012; Glassman et al. 2007), we believed that a history of this type of abuse would not be related to specific scar-related cognitions. In a similar vein, we hypothesized that the construct of stress reactive rumination would be relevant to individuals who repeatedly self-injure; however, we did not expect that specific scar-related cognitions would be related to this subtype of rumination. Finally, to determine if NSSI remitters experience the same degree of psychopathology associated with scar cognitions, we conducted a series of exploratory interaction analyses. We examined whether the significant relationships identified between NSSI scar cognitions and associated symptomatology are moderated by NSSI recency. However, we do not offer hypotheses for these analyses, given the lack of research to inform them.

Method

Participants and Procedures

A total of 397 undergraduates completed questionnaires on cognitions, emotions, stressful life events, and self-destructive behaviors in exchange for research credit (Study 1). Another 274 undergraduates completed questionnaires on cognitions, self-destructive behaviors, and social interactions in exchange for research credit (Study 2). Study 1 and 2 participants were recruited via advertisement through class announcements and flyers, and those interested in participating were instructed to sign up for and log into Temple University's (TU) online research system to enroll. Participants for both studies were considered enrolled upon consenting to study procedures. Once enrolled, participants in each study were instructed to complete online questionnaires hosted by the online survey tool, Fluid Surveys. The TU Institutional Review Board approved the procedures for both studies. Study 1's sample was 76.6% female and 58.2% Caucasian, 21.2% African American, 5.6% East Asian, 3.8% South Asian, 6.3% Biracial, and 4.8% other racial background. Study 2's sample was 81.4% female and 58.5%

Caucasian, 17.5% African American, 8.4% East Asian, 4.4% South Asian, 5.1% Biracial, and 5.8% other racial background. The final study sample consisted of the 110 participants from Study 1 and Study 2 who endorsed having at least one scar as a result of NSSI and who completed all items of the NSSI-Scar Cognition Scale. The final study sample was 85.5% female with 80% Caucasian, 4.5% African American, 2.7% East Asian, 2.7% South Asian, 7.3% Biracial, and 2.7% other racial background. Among the final study sample, there were no significant differences on age, $t(106) = 0.23, p = .82$, gender, $\chi^2(2, N = 110) = 1.77, p = .41$, or ethnicity, $\chi^2(5, N = 110) = 5.56, p = .35$, between Study 1 and Study 2 participants.

Measures

Non-Suicidal Self-Injury The Deliberate Self Harm Inventory (DSHI; Gratz 2001) is a self-report questionnaire that measures the presence, frequency, and methods of NSSI behaviors. NSSI methods include, but are not limited to, self-cutting, carving, burning, biting, and head-banging. Participants are asked whether they have engaged in 16 different NSSI methods with the prompt, “Have you ever intentionally (i.e., on purpose) _____?” If a participant endorses a particular method of NSSI, the participant is subsequently asked to indicate the lifetime frequency and last-year frequency of the particular behavior. Additionally, participants are also given the opportunity to indicate engagement in an NSSI method that was not included in the 16 options. We modified the DSHI to add the clause, “without intending to kill yourself” to each of the 17 questions to safeguard against participants endorsing any suicidal self-injurious behaviors on the questionnaire. For the purposes of this study, we classified lifetime and last-year NSSI frequency into categories (0, 1, 2–5, 6–20, 21–50, and 51+ NSSI acts; Whitlock et al. 2013; Burke et al. 2015a; Burke et al. 2015b). Previous literature has demonstrated the DSHI’s reliability and validity in undergraduate samples (Fliege et al. 2006; Gratz 2001).

Presence/Number/Locations of NSSI Scars For the present study, we modified the DSHI to assess if any of the NSSI methods individuals engaged in resulted in a scar or permanent mark. If a participant endorsed exhibiting a mark or scar due to engagement in NSSI, they were asked about the number and location of scars. We classified scar number into categories (0, 1, 2–5, 6–20, 21–50, and 51+ NSSI scars). Participants who reported exhibiting scarring secondary to NSSI were asked, “Where on your body do you have scars or marks from intentionally (i.e., on purpose) hurting yourself (without intending to kill yourself)?” Participants were instructed to indicate if a scar was present in each of 18 body locations. Additionally, participants were able to indicate an “other” location, permitting a write-in response.

Non-Suicidal Self-Injury Scar Cognitions The Non-Suicidal Self-Injury Scar Cognition Scale (NSSI-SCS) was developed for the purpose of this study to assess the experience of cognitions that individuals who bear scars from NSSI may experience (see Appendix 1). Six items were included that are reflective of positive cognitions about one’s scarring (e.g., “My scar(s) represent how strong I am emotionally.”). Eight items were included that are reflective of cognitions that one’s scarring reminds them of negative events and experiences in their past (e.g., “My scar(s) bring back memories of things that I don’t want to remember.”). Five items were included reflecting the cognitive connection between one’s scarring and suicide-related thoughts (e.g., “My scar(s) make me feel like I want to kill myself.”). Finally, seven items were included that reflect social and stigma-related cognitions about the presence of one’s scars (e.g., “My scar(s) make me embarrassed in front of other people.”). Participants were instructed to indicate how true each statement has been for them over the past two weeks. Responses were measured on a Likert scale ranging from 1 (“*Very Slightly Or Not At All*”) to 5 (“*Extremely*”). Twenty-six items were developed for this scale. After evaluating the measure, we retained twenty-three items. However, it is important to note that these twenty-three items remain an initial item pool and do not necessarily reflect the final NSSI Scar Cognition Scale, as further psychometric validation of the scale is indicated.

Scar Noticeability One item was developed for the purpose of this study to assess whether individuals who endorsed bearing at least one scar from NSSI believe that their scars are noticeable to others. Participants were asked, “Are these scars or marks noticeable to other people?” and were instructed to indicate either “Yes” or “No.” Participants also were asked, “How often do other people ask about these scars or marks?” and were instructed to indicate either “Never,” “Sometimes,” or “Often.” This question’s responses were dichotomized due to a low response rate ($n = 5$) for the answer, “Often.” Therefore, participants who endorsed “Never” were coded as “0” and participants who endorsed “Sometimes” or “Often” were coded as “1”.

Suicidal Ideation The Beck Scale for Suicidal Ideation (BSS; Beck and Steer 1991) was administered to assess SI experienced throughout the previous week. In addition to assessing both passive and active SI, the BSS inquires about suicide plans, preparations, and access to means to carry out plans. The BSS has demonstrated validity through strong correlation (.90) with an interview version of the scale (Beck et al. 1988). Furthermore, the BSS has demonstrated strong psychometric properties in a sample of university students (Chioqueta and

Stiles 2006). In the present sample, the internal consistency was good ($\alpha = .84$).

Depressive Symptoms The Beck Depression Inventory-II (BDI-II; Beck et al. 1996) is a 21-item self-report questionnaire that assesses the severity of depressive symptoms during the previous two weeks. The BDI-II has exhibited strong reliability and validity in psychometric studies (Beck et al. 1996), including in undergraduate samples (Storch et al. 2004). In the current sample, the BDI-II exhibited good internal consistency ($\alpha = .94$).

Social Anxiety Symptoms The Social Interaction Anxiety Scale (SIAS; Mattick and Clarke 1998) is a self-report questionnaire that assesses anxiety related to dyadic and group social interactions. The SIAS contains 20 Likert-type items rated from 0 (“*Not at all characteristic of me*”) to 4 (“*Extremely characteristic of me*”). In the current study, only the straightforwardly worded items were summed to create a total score, given research finding that the reverse-worded items may detract from the measure’s validity (Rodebaugh et al. 2007). The SIAS has demonstrated good reliability and validity and is used often to assess symptoms of social anxiety (Mattick and Clarke 1998; Rodebaugh et al. 2006; Safren et al. 1998). In the present study, the SIAS exhibited excellent internal consistency ($\alpha = .94$).

Acquired Capability for Suicide The Acquired Capability for Suicide Scale (ACSS; Van Orden et al. 2008) is a scale designed to assess habituation to the fear and pain involved in enacting lethal self-injury. The ACSS used in the current study is a 5-item scale adapted from the original 20-item scale, and has exhibited adequate reliability in prior research (Bryan et al. 2010; Bryan and Cukrowicz 2011; Fink-Miller 2015; Van Orden et al. 2008). In the current study, the ACSS exhibited good internal consistency ($\alpha = .75$).

Functions of Self-Injury The Inventory of Statements about Self-Injury (ISAS; Klonsky and Glenn 2009; Klonsky and Olino 2008) assesses the frequency and functions of NSSI. For the current study, we administered only the second section of the ISAS measuring NSSI functions. The ISAS measures 13 unique functions of NSSI, which have been classified into two factors: 1) intrapersonal functions, encompassing five functions (affect regulation, self-punishment, anti-dissociation, marking distress, and anti-suicide), and 2) interpersonal functions, encompassing eight functions (interpersonal boundaries, autonomy, peer bonding, interpersonal influence, sensation seeking, toughness, revenge, and self-care). Each of the 13 functions is measured with three items on a 3-point scale, ranging from 0 (*not at all relevant*) to 2 (*very relevant*)

to one’s experience of NSSI. The intrapersonal scale was calculated by summing its five subscales and dividing by five, and the interpersonal scale was calculated by summing its eight subscales and dividing by eight. Both the interpersonal and intrapersonal scales exhibited good internal consistency ($\alpha = .81$ and $\alpha = .87$, respectively).

Childhood Emotional Abuse The Childhood Trauma Questionnaire (CTQ; Bernstein et al. 2003) consists of 5 subscales assessing emotional abuse (EA) and neglect (EN), physical abuse (PA) and neglect (PN), and sexual abuse (SA). Each subscale consists of five items rated on a 5-point Likert scale ranging from 1 (*Never true*) to 5 (*Very often true*). For the current study, only the EA subscale was used. The CTQ has excellent reliability (Bernstein et al. 2003). In the current study, the CTQ-EA subscale exhibited good internal consistency ($\alpha = .89$).

Stress-Reactive Rumination The Stress Reactive Rumination Scale (SRRS; Robinson and Alloy 2003) was used to measure rumination on three distinct types of cognitions in response to major stressful life events: the tendency to experience negative attributions and inferences in line with a negative inferential style, the tendency to experience hopeless cognitions, and the tendency to focus on coping strategies and problem solving. The current study utilized the subscale, Negative Inferential Style, given that this subscale was found to be the only psychometrically sound subscale (Alloy et al. 2000). In the current sample, the negative inferential style subscale of the SRRS was found to have excellent internal consistency ($\alpha = .90$).

Data Analytic Method

Exploratory factor analysis (EFA) was conducted using principal axis extraction in SPSS. EFA was chosen as compared to confirmatory factor analysis (CFA) to prevent the restriction of the number and content of items in each factor (Fabrigar et al. 1999). Although it would be ideal to run a CFA subsequent to the EFA on a subset of our sample, given our limited sample size, we have deemed it inappropriate to do so (Fabrigar et al. 1999). As a result, studies with larger sample sizes should be conducted in the future including a CFA on the NSSI-SCS to increase the validity of this preliminary EFA. Importantly, we believe that the preliminary EFA of this sample remains a significant contribution to the literature, given the lack of research on NSSI scarring.

Given that it was hypothesized that the resulting factors would correlate with one another, oblique promax rotation was chosen for conducting the EFA. The Kaiser-Meyer-Olkin measure of sampling adequacy and the Bartlett’s test of sphericity were examined to determine the appropriateness of the data for factor analysis. In line with

EFA recommendations, items were retained if they had a minimum factor loading of .40. Several pieces of information were taken into account when choosing the number of factors to retain. We examined the scree plot, size of eigenvalues, amount of variance explained by each factor, the results of a MAP analysis, the results of a Parallel analysis, as well as the interpretability of the resulting factors (Warner 2012).

Bivariate correlations were used to examine correlations between SCS subscales and number of NSSI scars and NSSI severity proxies (i.e., lifetime and last year NSSI frequency, and number of NSSI methods endorsed). Bivariate correlations also were used to examine the convergent and divergent validity of the scale. Further, exploratory independent samples t-tests were used to examine group differences in SCS subscale scores based on self-reported scar noticeability and the degree to which others ask about one's scarring. Exploratory interaction analyses utilizing the SPSS macro PROCESS were conducted to determine if NSSI recency moderates the significant relationships found between NSSI scar cognitions and symptoms.

Results

Preliminary Analyses

Of 671 participants (from Study 1 and 2), 17.29% ($N = 116$) endorsed having at least one scar from NSSI. A total of 110 participants ($M = 20.13$ years, $SD = 2.35$; 85.5% female) who endorsed having at least one scar from NSSI and who completed all items of the NSSI Scar Cognition Scale were included in the study analyses and will be discussed henceforward. Lifetime frequencies of NSSI were: 4.5% ($n = 5$) 1 act, 20.9% ($n = 23$) 2–5 acts, 27.3% ($n = 30$) 6–20 acts, 17.3% ($n = 19$) 21–50 acts, and 28.7% ($n = 31$) over 50 acts. Study participants endorsed employing a mean of 2.17 different NSSI methods ($SD = 2.35$).

With regard to number of scars, 11.8% ($n = 13$) reported having one NSSI scar, 42.7% ($n = 47$) reported 2–5 scars, 28.2% ($n = 31$) reported 6–20 scars, 7.3% ($n = 8$) reported 21–50 scars, and 3.6% ($n = 4$) reported over 50 scars. Participants were asked to identify areas on their body in which they had at least one NSSI scar: 75.5% ($n = 83$) of participants endorsed at least one scar on their arm/wrist, 9.1% ($n = 10$) on their abdomen, 7.3% ($n = 8$) on their shoulder(s), 20% ($n = 22$) on their hip(s), 14.5% ($n = 16$) on their upper arm/elbow(s), 14.5% ($n = 16$) on their hand(s)/knuckle(s)/finger(s), 38.2% ($n = 42$) on their thigh(s), 10.9% ($n = 12$) on their lower leg/ankle(s), and less than 5% of participants endorsed scars on each of the following locations: scalp, face, neck/throat, chest, breast(s), back, buttocks, and knee. No participants endorsed scarring from NSSI on their

genitals. Participants endorsed exhibiting NSSI scarring on an average of 2.17 ($SD = 1.74$) body areas.

Factor Analysis

The Kaiser-Meyer-Olkin index was 0.800 and the Bartlett's test was highly significant ($p < 0.00001$), indicating that the data were appropriate for factor analysis. Of note, the initial EFA resulted in one item that did not load onto any factor (i.e., "My scar(s) make me feel like I can't handle the future" and one item that loaded onto two factors (i.e., "I think that I would have better relationships if I didn't have any scar(s)" (see Table 1). As a result, we re-ran the EFA after removing these two items. The results suggested that six factors exhibited eigenvalues over 1.0, suggesting that a solution with six or fewer factors would be most appropriate. However, inspection of the scree plot suggested that only the first five factors fell above the "elbow" of the plot, suggesting that a 6-factor solution would not be appropriate. Given the imperfect agreement between the scree plot and the eigenvalues, we performed a MAP analysis and a Parallel analysis to determine the best fitting solution. The MAP analysis suggested that a five-factor solution was superior to both a four-factor and a six-factor solution. The Parallel analysis suggested upwards of ten factors; given that this solution would lead to immense difficulty in interpreting our factors and because our other sources of information lent more support for a 5-factor solution (i.e., scree plot, MAP analysis), we made the decision to disregard the Parallel analysis findings. Therefore, we re-ran the factor analysis constricting the number of factors to five. The five-factor solution suggested that the item, "I think about my scars," cross-loaded on two factors and therefore, we removed this item and re-ran the factor analysis, constricting the factors to five. The eigenvalues for the first through fifth factors were 7.31, 3.81, 1.68, 1.35, and 1.20, respectively, and collectively accounted for 66.72% of the variance.

The pattern matrix of factor loadings (Table 2) was used to interpret the five factors. The first factor (SCS-reminder) was interpreted as reflecting that one's NSSI scars serve as reminders of past negative experiences (e.g. mistakes, failures, stressful events). The second factor (SCS-social) was interpreted as reflecting the belief that one's NSSI scars are embarrassing, that others judge them due to their scars, and that one's scars negatively affect them socially. The third factor (SCS-positive) was interpreted as reflecting the belief that one's NSSI scars demonstrate one's emotional and physical strength and are a source of hope and pride. The fourth factor (SCS-weak) was interpreted as reflecting the belief that one's NSSI scars signify their weakness. The fifth factor (SCS-suicide) was interpreted as reflecting the belief that one's NSSI scars make them feel hopeless, stuck, suicidal, and feel as if they have the capability to kill themselves if they desire.

Table 1 Factor loadings: First EFA run (26-Items; No items removed; EFA not restricted)

Items	Factor					
	1	2	3	4	5	6
10. My scar(s) make me embarrassed in front of other people.	0.93	0.09	0.14	-0.07	-0.17	-0.17
23. I think that people judge me because of my scar(s).	0.91	0.06	-0.12	-0.02	0.07	0.04
16. I think that people stare at my scar(s).	0.71	0.09	0.21	-0.17	-0.01	-0.01
13. I think about my scar(s).	0.59	-0.02	0.03	0.05	0.02	0.39
8. My scar(s) make me feel shame.	0.57	-0.04	0.27	0.21	-0.19	-0.11
18. My scar(s) make me feel unattractive.	0.56	-0.16	-0.07	0.18	0.14	-0.07
24. I think that I would have better relationships if I didn't have any scar(s).	0.53	-0.09	-0.29	0.09	0.44	-0.03
1. My scar(s) represent how strong I am emotionally.	0.12	0.98	-0.06	0.01	-0.05	-0.05
20. My scar(s) make me feel hopeful about my future.	0.08	0.76	-0.15	0.07	0.07	-0.06
2. My scar(s) represent how strong I am physically.	-0.07	0.62	0.11	-0.06	0.16	0.02
11. My scar(s) make me feel tough, like I can get through anything.	-0.12	0.58	0.04	-0.03	0.14	0.24
5. My scar(s) make me feel proud that I got through a very tough time.	-0.02	0.53	0.08	0.21	-0.12	0.15
6. My scar(s) remind me that I am weak.	-0.07	-0.01	0.80	0.13	-0.02	-0.08
7. My scar(s) make me feel afraid.	0.05	0.03	0.87	-0.07	0.07	0.00
12. My scar(s) make me feel like I am weak.	0.15	-0.08	0.73	-0.01	-0.02	0.02
3. My scar(s) bring back memories of things that I don't want to remember.	0.03	-0.01	-0.06	0.91	-0.10	0.01
9. My scar(s) remind me of stressful things that happened to me in the past.	0.05	0.13	-0.12	0.72	0.09	0.05
4. My scar(s) make me think about how weak I used to be.	-0.14	0.22	0.26	0.61	0.04	-0.20
15. My scar(s) make me think about my failures and mistakes.	0.03	-0.15	0.19	0.59	0.01	0.15
14. My scar(s) make me feel hopeless.	0.03	-0.08	0.25	0.10	0.59	-0.03
17. My scar(s) make me feel like I want to kill myself.	-0.01	0.13	-0.08	-0.07	0.81	-0.16
19. My scar(s) make me feel like I could kill myself if I wanted to.	-0.04	0.07	0.03	0.01	0.54	-0.03
22. My scar(s) make me feel like I can't change anything, like I'm stuck.	0.02	-0.06	0.38	0.01	0.53	0.11
25. I think that my scar(s) make me unique.	-0.10	0.08	0.05	-0.05	-0.16	0.87
26. My scar(s) make me feel less afraid of dying	0.01	0.04	-0.13	0.06	-0.01	0.80
21. My scar(s) make me feel like I can't handle the future.	0.20	0.12	0.22	-0.11	0.17	0.17

N= 110

Reliability Analyses

Items with loadings on the same factor (>.40) were summed to create total scores for each of the five factors. Subsequently, reliability analyses were performed: SCS-social ($\alpha = .88$, 5-items, item correlations ranged from .39–.73, $M = 9.42$, $SD = 5.17$), SCS-positive ($\alpha = .84$, 5-items, item correlations ranged from .29–.70, $M = 7.91$, $SD = 4.17$), SCS-weak ($\alpha = .88$, 3-items, item correlations ranged from .69–.73, $M = 4.77$, $SD = 2.68$), SCS-reminder ($\alpha = .83$, 4-items, item correlations ranged from .45–.63, $M = 9.17$, $SD = 4.31$), and SCS-suicide ($\alpha = .75$, 6-items, item correlations ranged from .11–.69, $M = 7.90$, $SD = 3.38$).

Subscale totals were each divided by the number of items included in the scale to derive mean scores that could be compared across scales. SCS-reminder cognitions were endorsed

to the highest degree ($M = 2.29$, $SD = 1.08$), followed by SCS-social cognitions ($M = 1.88$, $SD = 1.03$), SCS-weak cognitions ($M = 1.59$, $SD = 0.89$), SCS-positive cognitions ($M = 1.58$, $SD = 0.83$), and SCS-suicide cognitions ($M = 1.32$, $SD = 0.56$).

To determine the degree of relevance of each of the subscales to those who bear NSSI scarring, the percent of participants who endorsed experiencing any of the cognitions within each subscale (scoring between 2 and 5 on the 1–5 Likert scale on any of the particular subscale's items) was calculated: 79.1% of participants endorsed experiencing being reminded of negative events/thoughts by their NSSI scars, 63.6% endorsed experiencing at least some socially-related cognitions as a result of their NSSI scars, 52.7% endorsed experiencing at least some positive cognitions about their NSSI scars, 48.1% endorsed experiencing at least some weak-related cognitions about their NSSI scars,

Table 2 Factor loadings: Final EFA (3 Items removed; EFA restricted to five factors)

Item	Factor				
	Factor 1 SCS-Reminder	Factor 2 SCS-Social	Factor 3 SCS-Positive	Factor 4 SCS-Weak	Factor 5 SCS-Suicide
3. My scar(s) bring back memories of things that I don't want to remember.	0.93	0.02	0.00	-0.08	-0.09
9. My scar(s) remind me of stressful things that happened to me in the past.	0.72	0.05	0.11	-0.13	0.14
15. My scar(s) make me think about my failures and mistakes.	0.60	0.03	-0.14	0.14	0.17
4. My scar(s) make me think about how weak I used to be.	0.58	-0.09	0.19	0.29	-0.14
10. My scar(s) make me embarrassed in front of other people.	-0.05	0.96	0.08	0.04	-0.18
23. I think that people judge me because of my scar(s).	0.04	0.83	0.05	-0.16	0.20
16. I think that people stare at my scar(s).	-0.16	0.73	0.09	0.12	0.11
18. My scar(s) make me feel unattractive.	0.20	0.54	-0.18	-0.09	0.14
8. My scar(s) make me feel shame.	0.23	0.57	-0.03	0.20	-0.19
1. My scar(s) represent how strong I am emotionally.	-0.01	0.14	0.97	-0.02	-0.08
20. My scar(s) make me feel hopeful about my future.	0.07	0.07	0.73	-0.09	0.00
2. My scar(s) represent how strong I am physically.	-0.10	0.00	0.61	0.12	0.18
11. My scar(s) make me feel tough, like I can get through anything.	-0.04	-0.10	0.59	0.03	0.35
5. My scar(s) make me feel proud that I got through a very tough time.	0.22	-0.08	0.58	0.13	-0.02
6. My scar(s) remind me that I am weak.	0.08	-0.10	0.03	0.89	-0.12
7. My scar(s) make me feel afraid.	-0.07	0.05	0.06	0.85	0.08
12. My scar(s) make me feel like I am weak.	-0.04	0.11	-0.03	0.76	-0.01
26. My scar(s) make me feel less afraid of dying	0.09	-0.04	0.16	-0.21	0.62
22. My scar(s) make me feel like I can't change anything, like I'm stuck.	0.03	0.05	-0.08	0.34	0.58
17. My scar(s) make me feel like I want to kill myself.	-0.07	0.12	0.03	-0.06	0.57
14. My scar(s) make me feel hopeless.	0.07	0.10	-0.14	0.24	0.55
25. I think that my scar(s) make me unique.	-0.02	-0.14	0.23	-0.06	0.53
19. My scar(s) make me feel like I could kill myself if I wanted to.	-0.01	0.02	0.03	0.07	0.44

N= 110

and 42.7% endorsed experiencing at least some suicide-related thoughts due to their NSSI scars.

Factor Analysis Descriptives

As shown in Table 3, the SCS-social subscale was positively correlated with the SCS-reminder, SCS-weak, and SCS-suicide subscales. The SCS-positive subscale was positively correlated with the SCS-reminder subscale and the SCS-suicide subscale. The SCS-weak subscale was positively correlated with the SCS-social subscale, the SCS-reminder subscale, and the SCS-suicide subscale. Furthermore, the SCS-reminder subscale was positively correlated with the SCS-social subscale, the SCS-positive subscale, the SCS-weak subscale, and the SCS-suicide subscale. Based on this pattern of subscale correlations as well as on theory, an additional

subscale was subsequently created by summing the SCS-social, SCS-reminders, SCS-weak and SCS-suicide subscales in order to reflect one's total experience of negatively valenced cognitions about one's scarring. The SCS-Total Negative subscale exhibited excellent reliability ($\alpha = .90$).

Bivariate correlations revealed that age was not associated with any of the subscales (SCS-social: $r = .02, p = .81$; SCS-reminder: $r = .07, p = .50$; SCS-positive: $r = -.04, p = .69$; SCS-weak: $r = -.01, p = .95$, SCS-suicide: $r = .06, p = .52$; SCS-Total Negative: $r = .06, p = .56$). A series of independent samples t-tests revealed that gender was not associated with SCS-positive ($t = -1.26, p = .21$), SCS-weak ($t = -1.02, p = .31$), SCS-suicide ($t = 1.26, p = .23$), or with SCS-Total Negative ($t = -1.54, p = .13$). However, gender was significantly associated with the SCS-social subscale ($t = -3.27, p = .003$) and the SCS-reminder subscale ($t = -2.14,$

$p = .047$), such that females with NSSI scarring reported greater reminder-related and social-related cognitions about their NSSI scarring than males.

Bivariate correlations were used to examine associations between SCS subscales and number of NSSI scars, number of body areas with NSSI scarring, and NSSI severity proxies (i.e., lifetime and last year NSSI frequency, NSSI recency (engagement in NSSI over previous one year), and number of NSSI methods endorsed). Number of NSSI scars was significantly related to the SCS-social ($r = .31, p = .002$), SCS-suicide ($r = .22, p = .029$), and SCS-Total Negative ($r = .26, p = .008$) subscales. Number of body areas with NSSI scarring was significantly correlated with the SCS-social subscale ($r = .28, p = .004$). Lifetime and last year frequencies of NSSI were correlated with the SCS-social subscale ($r = .21, p = .030$; $r = .28, p = .004$, respectively). NSSI recency was significantly associated with the SCS-social ($t = -2.11, p = .037$), SCS-suicide ($t = -2.51, p = .014$), and SCS-Total Negative ($t = -2.09, p = .039$) subscales. Number of NSSI methods endorsed was significantly associated with the SCS-social subscale ($r = .19, p = .042$).

Tests of Concurrent Validity

The full sample ($N = 110$) was used to determine the concurrent validity of the SCS subscales with the Beck Depression Inventory-II (BDI-II), the Social Interaction Anxiety Scale (SIAS), the Beck Suicide Severity Scale (BSS); the concurrent validity of the SCS subscales and the Acquired Capability for Suicide Scale (ACSS) was administered with only Study 1 participants ($n = 68$). As displayed in Table 3, and consistent with hypotheses, bivariate correlations revealed that the SCS-social subscale was significantly positively correlated with SIAS. Also consistent with hypotheses, the SCS-reminder subscale, and the SCS-Total Negative subscale were each significantly positively correlated with the SIAS and the BDI-II. Furthermore, in line with hypotheses, the SCS-suicide subscale was positively correlated with the BSS and the ACSS. The SCS-weak subscale was significantly positively correlated with the SIAS and the BDI-II.

Counter to study hypotheses, the SCS-positive subscale was not correlated with the SIAS, BDI-II, or BSS. The SCS-positive subscale also was not correlated with the ACSS. Given that analyses suggested that the SCS-positive subscale was positively correlated with the SCS-Total Negative subscale and that very few individuals primarily reported positive cognitions without a presence of negative cognitions, we conducted a series of post-hoc partial correlations between the SCS-Positive subscale and the SIAS, BDI-II, and BSS, controlling for SCS-Total Negative. When controlling for total negative scar-related cognitions, the SCS-Positive subscale was significantly negatively correlated with the SIAS ($r = -.20, p = .036$). However, the relationships between the

SCS-Positive subscale and the BDI-II and BSS remained non-significant ($r = -.11, p = .24$; $r = -.06, p = .575$).

Concurrent validity was further assessed by conducting bivariate correlations between SCS subscales and self-reported function for engaging in NSSI using the Inventory of Statements about Self-Injury (ISAS). Consistent with hypotheses, the SCS-social subscale was positively correlated with intrapersonal functions of NSSI, but was not correlated with interpersonal functions. Also in line with study hypotheses, the SCS-positive subscale was positively correlated with interpersonal functions of NSSI, but was not correlated with intrapersonal functions. The SCS-reminder, SCS-weak, and SCS-suicide subscales were each significantly positively correlated with both interpersonal and intrapersonal functions of NSSI (see Table 3).

Tests of Divergent Validity

Participants from Study 1 included in the current analyses ($N = 68$) were utilized to examine divergent validity. Divergent validity was assessed by examining bivariate correlations between each of the SCS subscales and child emotional abuse (CTQ-EA) and stress reactive rumination (SRRS). In line with hypotheses, results suggested that none of the SCS subscales were significantly correlated with the CTQ-EA or with the SRRS (see Table 4).

Exploratory Analyses

Exploratory analyses were conducted to examine differences in scar cognitions based on self-reported noticeability of scars to others and on whether others ask them about their scars. Independent samples t-tests revealed that individuals who reported that their NSSI scars were noticeable to others ($n = 60$) scored significantly higher on the SCS-social ($t(108) = -5.57, p < .001$), SCS-reminder ($t(108) = -2.20, p = .030$), and SCS-weak ($t(108) = -2.23, p = .024$) subscales than those who reported that their NSSI scars were not noticeable to others ($n = 50$). There were no significant differences in levels of positive cognitions or suicide cognitions about one's scarring based on self-reported noticeability of scars to others.

Independent samples t-tests further revealed that individuals reporting that others ask about their NSSI scars ($n = 54$) scored significantly higher on the SCS-social subscale ($t(108) = -2.46, p = .015$) than those reporting that others do not ask about their NSSI scars ($n = 56$). There were no significant differences in levels of positive, reminder, weak, or suicide cognitions related to one's scarring based on self-report of whether others ask about their NSSI scars.

In order to determine if scar cognitions are relevant to assess for NSSI remitters (i.e., have not engaged in NSSI over the past year), exploratory interaction analyses were conducted to determine if NSSI recency moderates the significant

Table 3 Correlations between subscales and measures of concurrent validity (5-Factor Solution)

	1	2	3	4	5	6	7	8	9	10	11	12
1. SCS-Reminder												
2. SCS-Social	0.57***											
3. SCS-Positive	0.19*	0.04										
4. SCS-Suicide	0.34***	0.33***	0.45***									
5. SCS-Weak	0.54***	0.58***	0.14	0.41***								
6. SCS-Total Neg	0.83***	0.84***	0.22*	0.58***	0.82***							
7. BDI	0.24*	0.19	-0.04	0.15	0.33**	0.29**						
8. SIAS	0.29**	.39***	-0.09	0.17	0.41***	0.42***	0.40***					
9. BSS	0.02	0.05	-0.02	0.24*	0.14	0.13	0.40***	0.11				
10. ACSS	-0.15	-0.17	0.10	0.25*	-0.04	-0.07	0.29*	-0.16	0.24*			
11. Intrapersonal	0.50***	0.35***	0.19	0.22*	0.28**	0.46***	0.32	0.21*	0.17	0.17		
12. Interpersonal	0.31**	0.17	0.38***	0.57***	0.20*	0.34***	0.10	0.12	0.24	0.21	0.45***	

SCS-Reminder NSSI Scar Cognition Scale – Reminders subscale, *SCS-Social* NSSI Scar Cognition Scale – Social subscale, *SCS-Positive* NSSI Scar Cognition Scale – Positive subscale, *SCS-Suicide* NSSI Scar Cognition Scale – Suicide subscale, *SCS-Total Negative* NSSI Scar Cognition Scale – subtotal of negative subscales, *BDI* Beck Depression Inventory II, *SIAS* Social Interaction Anxiety Scale, *BSS* Beck Suicide Severity Scale, *ACSS* Acquired Capability for Suicide Scale, *Intrapersonal* Inventory of Statements about Self Injury - Intrapersonal subscale, *Interpersonal* Inventory of Statements about Self Injury - Interpersonal subscale. Variables 1–9 and 11–12 were assessed with the full sample ($N = 110$). The ACSS was administered with only Study 1 participants ($N = 68$)

* $p < .05$, ** $p < .01$, *** $p < .001$

relationships found between NSSI scar cognitions and associated symptoms (Table 3). Results indicated no significant interactions.

Discussion

The current study explored the psychometric properties of a scale developed to assess individuals' recent experiences of negative and positive cognitions about their NSSI scarring. The items developed for this scale were included based on clinical literature as well as on analysis of the content of online NSSI discussion boards; the relevance of the items generated has been supported by recent empirical studies (Bachtelle and Pepper 2015; Lewis and Mehrabkhani 2015). This scale will enhance the ability of clinicians and researchers to assess a range of NSSI scar-related cognitions, as well as their clinical correlates, and thus, inform both assessment and intervention development.

Factor analysis of the NSSI-SCS in an undergraduate sample demonstrated the emergence of five factors, which we used to create subscales. The first subscale (SCS-social) includes items reflecting that individuals with NSSI scarring believe their scarring negatively affects them socially, such as through engendering an experience of shame, embarrassment, and through increasing the degree to which one believes others judge them and stare at them. The finding that at least one cognition loading on the social-factor was endorsed by over 63% of individuals with NSSI scarring is in line with research suggesting that experience of shame is common

among those bearing permanent physical consequences of NSSI (Bachtelle and Pepper 2015; Lewis and Mehrabkhani 2015). Given the high degree of stigma against individuals with mental disorders in the United States (Hinshaw and Stier 2008), and that NSSI scars may likely be viewed as physical evidence of a mental disorder, it is not surprising that those bearing NSSI scars experience the psychosocial consequences of stigmatization. The cognitions assessed in the SCS-social subscale are very much in line with common cognitions experienced by people who are stigmatized (Pachankis 2007), and thus, may be useful to determine the degree to which individuals with NSSI scarring experience the psychological effects of stigma.

The second subscale includes items reflecting positive views about one's NSSI scars, such as cognitively appraising them as sources of pride and hope as well as perceiving them as demonstrating both physical and emotional strength. Approximately half of the sample endorsed experiencing at least one positive cognition about their NSSI scarring. That the experience of positive cognitions about one's NSSI scarring is prevalent is in line with empirical and clinical literature (Bachtelle and Pepper 2015; Lewis and Mehrabkhani 2015).

The third subscale includes items suggesting that one's scars serve as reminders of past negative experiences. Individuals endorsed experiencing these NSSI scar-related cognitions to a greater degree than any of the other scar-related cognitions (i.e., 79% endorsed such cognitions). The current findings build on evidence suggesting that a portion of NSSI remitters experience these cognitions (Whitlock et al. 2014), by finding that both current and remitted self-injurers who bear NSSI

Table 4 Correlations between subscales and measures of divergent validity

	1	2	3	4	5	6	7	8
1. SCS-Reminder								
2. SCS-Social	0.57***							
3. SCS-Positive	0.19*	0.04						
4. SCS-Suicide	0.34***	0.33***	0.45***					
5. SCS-Weak	0.54***	0.58***	0.14	0.41***				
6. SCS-Total Neg	0.83***	0.84***	0.22*	0.58***	0.82***			
7. SRRS-NegInf	0.17	0.07	-0.19	0.12	0.13	0.15		
8. CTQ-EA	0.01	0.04	0.08	0.06	-0.02	0.02	0.23	

SCS-Reminder NSSI Scar Cognition Scale – Reminders subscale, *SCS-Social* NSSI Scar Cognition Scale – Social subscale, *SCS-Positive* NSSI Scar Cognition Scale – Positive subscale, *SCS-Suicide* NSSI Scar Cognition Scale – Suicide subscale, *SCS-Total Negative* NSSI Scar Cognition Scale – subtotal of negative subscales, *SRRS-NegInf* Stress Reactive Rumination Scale – Negative Inferential subscale, *CTQ-EA* Childhood Trauma Questionnaire – Emotional Abuse subscale. Variables 1-6 were assessed with the full sample (N = 110). The SRRS and the CTQ-EA were administered with only Study 1 participants (N=68).

* $p < .05$, ** $p < .01$, *** $p < .001$

scars experience such cognitions. Given research suggesting individuals engage in NSSI often in the context of intrapersonal and/or interpersonal distress, it is reasonable that particular scars resulting from NSSI act to trigger specific memories of aversive past experiences. It also has been suggested that viewing one’s NSSI scarring may trigger similar phenomenological states experienced during the self-injury episode itself (Burke et al. 2016). Thus, it is not surprising that the items that loaded onto this subscale were commonly endorsed.

The fourth subscale (SCS-suicide) includes items reflecting the experience of cognitions linking one’s NSSI scarring to suicide-related thoughts. For example, the subscale includes items suggesting that one’s scars lead to the experience of hopelessness and feeling ‘stuck’. Perhaps the permanency of these physical scars reduce one’s hope to be able to move beyond one’s negative state. Items that also loaded onto this factor, and thus, were incorporated into the suicide subscale include those in line with the IPTS’ hypothesized role of acquired capability in enacting suicidal behavior. Indeed, individuals who endorsed feeling hopeless, stuck, and suicidal due to their NSSI scarring were significantly likely to experience thoughts such as, “My scar(s) make me feel like I could kill myself if I wanted to” and “My scar(s) make me feel less afraid of dying.” The finding that these items hung together provide initial evidence that NSSI scarring may play a role in the prospective link between NSSI and enacting suicidal behavior (Hamza et al. 2012). It is possible that the existence of NSSI scars may not only increase suicide desire, but also may strengthen individuals’ acquired capability to carry out suicidal acts. Future research should explore this potential mechanism.

A surprising result was that the item, “My scars make me feel unique” loaded strongly on the suicide factor. This item was initially generated to reflect a potential positive cognition related to one’s NSSI scars. Some individuals who self-injure

believe that engaging in NSSI makes them unique and theory has purported that self-injuring may contribute to the attainment of a desired sense of identity (Breen et al. 2013). However, given the item’s strong loading onto the suicide factor, it is possible that this item may instead reflect a negatively valenced self-perception of uniqueness. Perhaps uniqueness is perceived as so different, as to not feel as if one belongs. In turn, a sense of thwarted belongingness has been hypothesized by the IPTS to be a risk factor for suicidal ideation, which may account for this unexpected finding. However, this conjecture is speculative and should be investigated further before any conclusions are drawn.

Unexpectedly, we found a fifth factor (SCS-weak) that included three items reflecting one’s self-perception as weak due to their NSSI scarring. Example items in this subscale include, “My scar(s) make me feel like I am weak,” and “My scar(s) make me feel afraid.” Individuals endorsing items on this scale may experience feeling weak in their ability to handle stress and to thwart their urges to engage in NSSI. Furthermore, they may feel afraid of what they may do if they experience negative arousal in the future. However, given that this factor was not formally hypothesized, future research should aim to clarify the conceptual underpinnings of this factor.

The psychometric analyses we performed supported the construct validity of the NSSI-SCS. Significant correlations were found in the expected directions between the SCS-social, SCS-reminder and SCS-suicide subscales and like measures of self-reported social anxiety, depression, suicidal ideation, and acquired capability for suicide (i.e. concurrent validity). Furthermore, significant correlations between the SCS subscales with NSSI functions provide further evidence of concurrent validity and suggest that this scale is relevant to other validated measures of NSSI. Further supporting the construct validity of the NSSI-SCS, and in line with hypotheses, the

SCS subscales also exhibited divergent validity, through non-significant correlations with constructs deemed to be unlike those measured by the SCS (emotional abuse and stress reactive rumination). Results of group difference analyses based on self-reported scar noticeability and whether others inquire about one's scars provide additional validity support for the SCS-social and SCS-reminder subscales. Additionally, our psychometric analyses indicated that the subscales have good to excellent reliability. Although the current analyses suggest initial psychometric validation, future research should examine the test-retest reliability of the NSSI-SCS, as well as its sensitivity to change, particularly in the context of treatment research.

Of note, counter to study hypotheses, the SCS-positive subscale did not correlate significantly with any symptom measures. However, it is important to highlight that very few participants experienced primarily positive cognitions about their scarring. Rather, the vast majority of those who experienced elevated levels of positive cognitions about their NSSI scarring in the current sample simultaneously endorsed experiencing negative cognitions about their scarring. Indeed, the SCS-positive subscale was significantly positively correlated with both the SCS-reminder and SCS-suicide subscales. Furthermore, only two participants scoring one standard deviation above the mean on positive cognitions simultaneously scored one standard deviation below the mean on negative cognitions. Our finding that many individuals experience mixed feelings about their NSSI scarring is in line with extant literature suggesting that many individuals bearing NSSI scarring express a “love/hate relationship” with their scarring (Lewis and Mehrabkhani 2015). It is possible that the common co-occurrence of positive and negative cognitions about one's NSSI scarring may be responsible for the non-significant relationships between positive scar cognitions and psychological symptomatology. As a result, we performed a series of post-hoc partial correlations to examine the relationships between the SCS-positive subscale and symptom measures, controlling for total negative cognitions. We found that when controlling for negative cognitions, the SCS-positive subscale evidenced a significant negative correlation with symptoms of social anxiety. Our findings suggest that positive cognitions about one's scarring may either serve as a buffer for the experience of social anxiety symptoms, or alternatively, that low social anxiety symptoms may allow one to adopt more positive cognitions about their scarring secondary to NSSI. Future studies should collect a larger sample of individuals bearing NSSI scars to allow for the prospective examination of group differences between those endorsing primarily positive cognitions about one's scarring versus those with mixed cognitions and those with primarily negative cognitions. Such a

sample would allow us to further probe the directionality of the inverse relationship between positive cognitions about one's NSSI scarring and social anxiety symptomatology. However, given the low frequency of positive cognitions without accompanying negative cognitions about NSSI scarring in the current sample, it is possible that a primarily positive cognition group may be difficult to attain.

Clinical Implications

The current study suggests important clinical implications for the assessment of individuals with current and past NSSI. Given evidence that a significant portion of those bearing NSSI scars experience ongoing negative cognitions about their scarring, and that these negative cognitions are related to clinical symptoms, scar cognitions should be assessed regularly to inform treatment planning. Each of the subscales measuring varying negative cognitions about one's scarring is associated with psychological symptoms of distress (e.g., social anxiety, depression, suicidal ideation). Thus, it is possible that cognitions about one's NSSI scarring may pose risk for current self-injurers to continue self-injuring and NSSI remitters to relapse, as it is negative emotionality that frequently precedes NSSI episodes (Klonsky 2009). In this respect, it is possible that the experience of negative cognitions about one's scarring may feed into a vicious cycle of distress and self-harming behaviors. Indeed, one might hypothesize that individuals who perceive their NSSI scarring to be socially aversive would be less likely to continue engaging in the behavior. The current results suggest otherwise. It appears that those who experience the greatest levels of social cognitions (i.e., experience of shame and embarrassment due to scarring, feeling stared at and judged) are actually the most likely to have engaged in the behavior recently.

Although recent self-injurers evidence greater levels of SCS-social and SCS-suicide scar-related cognitions, remitters endorse experiencing these cognitions as well. Furthermore, NSSI remitters experience the SCS-reminder scar-related cognitions at a similar level to recent self-injurers. Moreover, interaction analyses indicate that the relationships between the SCS subscales and clinical symptoms were not affected by NSSI recency. These results emphasize the importance of assessing scar cognitions among both active and remitted self-injurers.

For individuals who endorse high levels of negative cognitions about their scarring, Cognitive Behavioral Therapy (CBT) may be indicated. Cognitive restructuring techniques may aid individuals in identifying the occurrence of automatic negative thoughts about their scarring and help them to evaluate and ultimately reappraise the thoughts. Particularly for individuals evidencing a high degree of social cognitions

about their NSSI scarring, therapeutic approaches addressing shame will be important for effective treatment (Lewis 2016). Acceptance and Commitment Therapy and Dialectical Behavior Therapy both incorporate acceptance-based skills and have evidenced support in reducing self-harming behavior (Gratz and Gunderson 2006; Mehlum et al. 2014). For individuals who report high levels of SCS-suicide cognitions, it also will be imperative to thoroughly assess for suicide risk and to intervene directly to reduce the frequency of suicidal thoughts and behaviors. In addition to informing assessment and treatment, the current study also provides information that may be helpful when designing preventive interventions. Psychoeducation about the detrimental psychological and interpersonal consequences of engagement in NSSI may prevent engagement in the behavior before it has been initiated or curb behavior immediately after initiation.

Strengths and Limitations

The establishment of validity of this new measure represents an important contribution to the field, as it is the first measure designed to comprehensively assess NSSI scar-related cognitions. Given that this study revealed that a sizable number of undergraduates (17.29%) bear such permanent physical consequences of self-injury and that a majority of them experience negative cognitions about their scarring, this measure offers a promising direction to help shape intervention efforts. Despite the study's strengths, it is important to understand its limitations. First, the current study is limited by the use of solely self-report questionnaires, potentially exaggerating associations between the NSSI-SCS subscales and other measures as a result of shared method variance. The supported divergent validity of the subscales, however, reduces the likelihood of this potential limitation. Future studies should validate scar presence with an in-person interview and physical examination, thereby permitting scar characteristics, which may influence cognitions, to be objectively assessed. Second, exploratory factor analysis revealed an imperfect agreement between factor solution indices (i.e., eigenvalues, scree plot, MAP analysis). Despite our ultimate decision to pursue a five-factor solution, it is possible that a six-factor solution may be a better fit, particularly if we were to attain a larger sample size or generate additional items for the scale. Future studies should perform confirmatory factor analysis (CFA) with a larger sample to confirm the best fitting factor solution. CFA also would allow for the examination of the validity of our post-hoc subscale created to reflect a sum of one's negative scar-related cognitions (SCS-Total Negative). Moreover, future studies should examine the current set of items to refine item wording and content in the pursuit of reaching an ideal representation of content areas, in line with scale development recommendations (e.g., Clark and Wells

1995). Third, the current sample was primarily female (83%), and thus, may have been underpowered to detect gender differences in scar-related cognitions. However, this study did reveal gender differences such that females exhibited significantly greater social cognitions than males and a similar trending relationship was found for reminder cognitions ($p = .05$). Extant research suggests that engaging in NSSI may lead to elevated clinical symptoms and interpersonal issues among females only (Burke et al. 2015a; Lundh et al. 2011a, b). It is possible that the greater severity of negative cognitive sequelae of NSSI scarring among females may be one mechanism explaining this gender difference. Future prospective research with a greater proportion of males will need to be conducted to evaluate this hypothesis. Fourth, since the development of this scale, literature suggests that guilt may be a relevant cognition to explore when assessing scar cognitions (Bachtelle and Pepper 2015). Consequently, future research should explore this connection further and potentially add guilt-related items when refining the NSSI-SCS. Fifth, the current study is limited by its cross-sectional data collection. Future studies should examine the test-retest reliability of this measure. Determining the scale's sensitivity to change will be important in order to determine if scar-related cognitions are affected by treatment. Furthermore, prospective studies utilizing this measure are encouraged to examine whether particular scar-related cognitions predict clinical symptoms over time. Future studies also should examine moderators of the relationship between scar presence/number and scar related cognitions. Indeed, it will be critical for intervention to determine what factors make an individual more or less likely to develop specific scar-related cognitions; factors that likely moderate this association include scar location, appearance and size, as well as self-esteem and body image.

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Compliance with Ethical Standards

Conflict of Interest Taylor A. Burke, Thomas M. Olino and Lauren B. Alloy declare that they have no conflict of interest.

Funding This study was unfunded.

Experiment Participants All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

Appendix 1. Non-Suicidal Self-Injury Scar Cognition Scale (NSSI-SCS)

Instructions: *Please think about your scar(s) from intentionally hurting yourself without suicidal intent.*

How true has each statement been for you over the past 2 weeks?	Very slightly or not at all	A little bit	Moderately	Quite A bit	Extremely
1. My scar(s) represent how strong I am emotionally.	1	2	3	4	5
2. My scar(s) represent how strong I am physically.	1	2	3	4	5
3. My scar(s) bring back memories of things that I don't want to remember.	1	2	3	4	5
4. My scar(s) make me think about how weak I used to be.	1	2	3	4	5
5. My scar(s) make me feel proud that I got through a very tough time.	1	2	3	4	5
6. My scar(s) remind me that I am weak.	1	2	3	4	5
7. My scar(s) make me feel afraid.	1	2	3	4	5
8. My scar(s) make me feel shame.	1	2	3	4	5
9. My scar(s) remind me of stressful things that happened to me in the past.	1	2	3	4	5
10. My scar(s) make me embarrassed in front of other people.	1	2	3	4	5
11. My scar(s) make me feel tough, like I can get through anything	1	2	3	4	5
12. My scar(s) make me feel like I am weak.	1	2	3	4	5
13. I think about my scar(s).	1	2	3	4	5
14. My scar(s) make me feel hopeless.	1	2	3	4	5
15. My scar(s) make me think about my failures and mistakes.	1	2	3	4	5
16. I think that people stare at my scar(s)	1	2	3	4	5
17. My scar(s) make me feel like I want to kill myself.	1	2	3	4	5
18. My scar(s) make me feel unattractive.	1	2	3	4	5
19. My scar(s) make me feel like I could kill myself if I wanted to.	1	2	3	4	5
20. My scar(s) make me feel hopeful about my future.	1	2	3	4	5
21. My scar(s) make me feel like I can't handle the future.	1	2	3	4	5
22. My scar(s) make me feel like I can't change anything. like I'm stuck.	1	2	3	4	5
23. I think that people judge me because of my scar(s).	1	2	3	4	5
24. I think that I would have better relationships if I didn't have any scar(s).	1	2	3	4	5
25. I think that my scar(s) make me unique.	1	2	3	4	5
26. My scar(s) make me feel less afraid of dying.	1	2	3	4	5

Items 13, 21, and 24 were excluded from the final scale

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