



Functions of nonsuicidal self-injury (NSSI): Cross-sectional associations with NSSI duration and longitudinal changes over time and following treatment



Sarah E. Victor^{a,*}, Denise Styer^b, Jason J. Washburn^{b,c}

^a Psychology Department, University of British Columbia, Vancouver, BC, Canada

^b Center for Evidence-Based Practice, Alexian Brothers Behavioral Health Hospital, Hoffman Estates, IL, USA

^c Department of Psychiatry and Behavioral Sciences, Northwestern University Feinberg School of Medicine, Chicago, IL, USA

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ABSTRACT

In this study, we sought to clarify if and how the functions of nonsuicidal self-injury (NSSI) relate to duration of NSSI or change over time. To accomplish this aim, we analyzed data obtained from routine clinical evaluations completed within a specialized acute-care treatment program for NSSI. Specifically, we examined how functions of NSSI vary between patients by duration of NSSI, how functions changed within patients over time, and how changes in NSSI functions related to treatment outcomes. Neither internal nor social functions were associated with NSSI duration between patients after controlling for relevant covariates. For patients completing two admissions assessments, internal and social functions decreased similarly over time, although the decrease in internal functions was no longer significant after controlling for decreases in NSSI urges. For patients who completed admissions and discharge assessments, internal and social functions decreased over the course of treatment, with larger decreases in internal functions. Decreases in both types of functions related to improved treatment outcomes. In conclusion, our results suggest that NSSI functions are generally stable across time, although decreases in NSSI functions may relate to clinical improvement.

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1. Introduction

Nonsuicidal self-injury (NSSI) is the direct and intentional self-inflicted bodily injury without suicidal intent and for purposes not socially sanctioned (ISSS, 2007). NSSI is prevalent, particularly among adolescents and young adults, where rates of at least one incident of NSSI are estimated to be approximately 18% among community populations (Muehlenkamp et al., 2012) and up to 67% in clinical populations (Wolff et al., 2013). Despite involving low lethality behaviors, NSSI is associated with increased risk for medically severe injuries (Whitlock et al., 2011) and a host of psychological difficulties, including depression, anxiety, disordered eating behavior, substance use, and suicidal thoughts and behaviors (Klonsky et al., 2011).

Early work on NSSI by Menninger (1938) described what he called self-mutilation as “a partial suicide to avert total suicide” (p. 271). Favazza (1998) echoed this perspective sixty years later, describing self-injury as a “morbid form of self-help that is antithetical to suicide”. In both instances, these early theorists

grappled with the perceived goals, motivations, or functions of NSSI. With a burst of interest in NSSI among researchers over the last decade (Nock, 2009), the functions that underlie NSSI have received substantial empirical attention (Chapman et al., 2006; Klonsky, 2007). In the context of NSSI, *functions* refer to either the self-reported reasons for engaging in NSSI behaviors, or the expected or actual consequences of the behaviors; in this study, we examined the self-reported reasons for engaging in NSSI behaviors.

The overwhelming evidence from numerous studies of self-reported motives for NSSI indicates that NSSI occurs for not a singular reason, but for a variety of reasons. In a study of high school students, self-injurers endorsed an average of five reasons for NSSI (Lloyd-Richardson et al., 2007). In a sample of self-injurers participating in online social networking sites, 42% of participants endorsed all five of the functions queried, and an additional 41% endorsed four of the five functions (Turner et al., 2012). Additionally, a study of adults sampled using random-digit dialing found that two-thirds of self-injurers reported two or more functions for their NSSI behaviors (Klonsky, 2011).

The four-factor model of NSSI functions (Bentley et al., 2014; Nock and Prinstein, 2005) proposes that NSSI functions can be grouped into automatic (internal) and interpersonal (social)

* Corresponding author.

E-mail address: SEVictor@psych.ubc.ca (S.E. Victor).

functions, both of which can be further divided into positive and negative functions. In this context, positive functions refer to the desire to increase or obtain some state or goal, while negative functions refer to the desire to avoid or reduce an unpleasant state. Klonsky (2007, 2009) described a more parsimonious two-factor model of NSSI functions, distinguishing between internal and social functions, highlighting the important role of the internal function of affect regulation as the most common function of NSSI. Chapman and colleagues (2006) further specified the functions of NSSI, proposing that NSSI is primarily negatively reinforcing, in that it allows individuals to escape or avoid painful emotional experiences. Studies examining NSSI functions have shown similar types and patterns of functions in both clinically referred and nonclinical samples of adolescents and adults (Klonsky, 2007; Lindholm et al., 2011; Sadeh et al., 2014).

Understanding the functions of NSSI is important for several reasons. First, endorsing a higher number of NSSI functions is associated with increased risk for psychopathology (Lloyd-Richardson et al., 2007; Turner et al., 2013; Victor and Klonsky, 2014). Specific NSSI Functions also vary in their association with risk for specific psychopathology. For example, while, automatic negative reinforcement of NSSI has been shown to be specifically associated with hopelessness and prior suicide attempts, automatic positive reinforcement has been shown to be associated with posttraumatic stress disorder and major depressive disorder (Nock and Prinstein, 2005). Further, while self-injurers with high scores on both social and internal NSSI functions have greater depression and anxiety than other self-injurers, those with high internal but low social scores have the highest prevalence of suicidal ideation and attempts compared to other people who self-injure (Klonsky and Olin, 2008). Additionally, knowledge of NSSI functions can help clarify the types of deficits self-injurers experience; for example, recent research suggests that individuals using NSSI for internal functions have more difficulties with emotional reactivity and regulation, while individuals using NSSI for social functions have more difficulty with problematic interpersonal styles (Turner et al., 2012). Finally, understanding the functions of NSSI can be essential to tailoring treatment interventions for self-injurers (Klonsky and Muehlenkamp, 2007; Walsh, 2007; Washburn et al., 2012b).

The creation and validation of assessment tools to investigate NSSI functions has been an important part of the study of self-injury over the past several decades. Dozens of measures have been designed to assess NSSI characteristics in a variety of samples, many of which include items assessing the functions of NSSI. Some of the most common self-report measures of NSSI functions include the Inventory of Statements About Self-Injury (ISAS; Glenn and Klonsky (2009)), the Functional Assessment of Self-Mutilation (FASM; Lloyd et al. (1997)), and the Ottawa Self-Injury Inventory (OSI; Nixon and Cloutier (2005)). There have also been several validated interview measures of NSSI functions, including the Self-Injurious Thoughts and Behaviors Interview (SITBI; Nock et al. (2007)) and the Suicide Attempt Self-Injury Interview (SASII; Linehan et al. (2006)).

Unfortunately, in spite of the plethora of measures of NSSI functions and the clear importance of understanding the reasons for NSSI, it remains unclear if NSSI functions are consistent over time. NSSI functions may represent static constructs that remain relatively stable across time. Alternatively, NSSI functions may represent dynamic constructs that change over the course of the condition, such as from onset of NSSI to repeated and continued NSSI. For example, a recent cross-sectional study by Muehlenkamp and colleagues (Muehlenkamp et al., 2013) found that college students with a history of NSSI were more likely to report social reasons for initiating NSSI behaviors than for the continued use of NSSI. In contrast, the use of NSSI for emotion regulation was more

likely to be reported for continued NSSI, compared to the initial onset of the behavior.

A limited number of studies have examined NSSI functions over time. In one study assessing NSSI functions across a one-year interval in a university student population (Glenn and Klonsky, 2011), internal and social functions of NSSI were relatively stable, with small decreases in endorsement of each type of function over the year. A similar pattern of results was found for Chinese high school students assessed with respect to the affect regulation, social influence, and social avoidance functions of NSSI at two time-points, six months apart (You et al., 2013). These studies, however, are limited by the use of samples of general population high school and university students. The functions of NSSI and the stability of NSSI functions may differ for patients in clinical settings. To our knowledge, only one study has investigated self-reported functions of NSSI over time in a clinical population. Zanarini et al. (2013) followed adult patients with Borderline Personality Disorder (BPD) every two years over a 16-year follow-up, finding that patients with more lifetime episodes of NSSI at baseline reported more internal reasons for NSSI across follow-up than patients with fewer episodes of NSSI.

In each of the extant studies, participants were either asked to report retrospectively on their NSSI functions over time, or were assessed over a long period of time; as a result, little is known about the short-term stability of NSSI functions in clinical populations, which may be more – or less – susceptible to change. Treatment strategies, such as developing adaptive emotion regulation skills (Gratz et al., 2014), may directly alter the functions of NSSI over the course of treatment. Further, group-based treatment, especially among adolescents, may increase the instability of NSSI functions through social modeling (De Leo and Heller, 2008; Schwartz et al., 1989).

To further understand the stability of NSSI functions, we examined three questions in a large sample of adolescents and adults receiving acute treatment for NSSI. Given that existing NSSI research on changes in functions over time has primarily characterized these functions using a two-factor structure, we also focused primarily on the distinction between internal and social NSSI functions, rather than using the four-factor model proposed by Nock and Prinstein (2004).

First, we examined whether NSSI functions vary with the recency of onset of NSSI behavior. Specifically, given the potentially reinforcing nature of NSSI (Chapman et al., 2006), we hypothesized that at the time of admission to acute care treatment, individuals with a longer duration of NSSI would report greater internal (automatic) NSSI functions..

Second, we examined if NSSI functions changed over time within individuals. To obtain the best proxy of naturalistic change over time in a sample that received treatment, we examined individuals who were admitted for NSSI treatment on two or more separate occasions. By comparing patients' NSSI functions at two different admission time points, we control, to the best of our ability, the influence of treatment on their NSSI functions. We hypothesized that patients would report reductions in all NSSI functions at later admission (consistent with findings from Glenn and Klonsky (2011)), and that these decreases would be greater for internal than social NSSI functions.

Finally, we examined if changes in NSSI functions during a single treatment period (from admission to discharge) were associated with treatment outcomes; we hypothesized that greater decreases in internal and social functions overall would be associated with greater clinical improvement. We also conducted exploratory analyses to investigate if more specific internal and social functions of NSSI (e.g., affective regulation, interpersonal influence) would be associated with clinical improvement at the end of treatment.

2. Methods

2.1. Participants and procedures

Data were collected from adolescents and adults being treated in a partial hospitalization and intensive outpatient treatment program specifically for self-injury and other self-destructive thoughts and behaviors at a large behavioral health hospital located in the Midwestern United States. As part of routine clinical evaluation and outcomes assessment, patients completed a series of NSSI-specific clinical outcome measures at admission and discharge for the treatment program, including measures of NSSI methods, severity, and functions.

All data used in these analyses were obtained through archival records from clinical outcome databases and medical records at the behavioral health hospital. All data were de-identified prior to analyses, following the "Safe Harbor" de-identification standard for protected health information. Procedures for this research study were reviewed by the hospital systems' Institutional Review Board and found to be exempt from further IRB review pursuant with 45CFR46.101(b).

A total of 1780 patients completed at least one measure of NSSI functions. The sample was primarily Caucasian ($n=1260$, 86.8%) and female ($n=1554$, 88.4%), with a median age of 16.1 years ($M=18.3$, $SD=7.2$). The majority of the sample were adolescents ($n=1281$, 72.8%) or emerging adults (18–25, $n=385$, 18%). Up to five clinical diagnoses, provided by attending psychiatrists, were recorded in the medical record, with a mean of 3.7 ($SD=1.6$) diagnoses. The most common primary diagnosis was a mood disorder ($n=1074$, 61.3%). The most common methods of NSSI in the past year were cutting ($n=651$, 90%) and scratching ($n=408$, 56.4%), with patients reporting an average of 3.76 different methods of NSSI in the past year ($SD=2.6$). Patients reported a mean age of onset of NSSI of 11.2 years of age ($SD=4.09$), with a mean duration of NSSI of 6.5 years ($SD=6.7$). Additional demographic information can be found in [Table 1](#).

2.2. Measures

2.2.1. Demographic and clinical characteristics

Basic demographic characteristics (age, ethnic/racial background, gender) and diagnoses of mental disorders were obtained from electronic medical records.

2.2.2. NSSI characteristics

The Alexian Brothers Assessment of Self-Injury (ABASI; [Washburn et al. \(2015\)](#)) was developed to facilitate program evaluation and patient assessment regarding NSSI. This measure includes assessment of the methods and frequency of NSSI behaviors in the past year. The measure has been validated in a clinical sample of adolescents and adults, and has been shown to have good test-retest reliability for its assessment of recent NSSI behaviors ([Washburn et al., 2015](#)).

2.2.3. NSSI functions

Functions of NSSI were assessed with the Inventory of Statements About Self-Injury (ISAS), which has demonstrated appropriate convergent validity and internal consistency in previous research ([Klonsky and Glenn, 2009](#)). A short form of the ISAS, which shows equivalency with the full form, was used as part of the clinical assessment battery (ISAS-SF; [Washburn et al. \(2012a\)](#)). The ISAS-SF includes 13 theoretically-derived subscales, which load onto two factors: internal (intrapersonal) and social (interpersonal). In this sample, the two primary factor scales demonstrated high internal consistency (Cronbach's α internal=.82, Cronbach's α social=.83).

2.2.4. Self-injury urges

The Alexian Brothers Urge to Self-Injure Scale (ABUSI; [Washburn et al. \(2010\)](#)) is a self-report measure of urges for NSSI. This measure has exhibited predictive and convergent validity in previous research with clinical populations ([Washburn et al., 2010](#)). In this context, the measure was used to investigate treatment outcome, with decreases in NSSI urges indicating greater treatment response. Internal consistency in this sample was high (Cronbach's α =.93).

2.2.5. Quality of life

The Quality of Life Enjoyment and Satisfaction Questionnaire ([Endicott et al., 1993](#)) is a self-report measure assessing multiple domains relevant to overall quality of life. An overall value was calculated for each patient based on their reported quality of life as a percentage of the maximum possible quality of life score; higher scores on this measure are associated with greater quality of life and an increase in this score from intake to discharge would indicate a positive response to treatment. In this sample, internal consistency was good (Cronbach's α =.88).

2.3. Data analyses

Because data were collected through routine clinical assessment, the data available for specific analyses varied, due both to data missing at random as well as measures being started or discontinued over time in accordance with clinical and programmatic needs. Additionally, patients could re-enroll in the program after their first discharge, yielding repeated sets of data for some individuals.

The first set of analyses sought to examine the association between duration from onset of NSSI and the functions of NSSI across individuals. Potential demographic covariates (age, gender, Caucasian versus non-Caucasian ethnicity) as well as clinical covariates (urge to engage in NSSI and number of NSSI injuries in the past week) were examined for inclusion in our analyses of interest. Primary analyses utilized Pearson's correlations (r s), while analyses including covariates used partial correlations. For this hypothesis, patients were included if they provided data on NSSI functions, NSSI age of onset, and current age at any admission assessment. For patients with more than one assessment, only the first relevant

Table 1
Sample demographic and clinical characteristics.

Race/ethnicity	Overall sample	Hypothesis 1	Hypothesis 2	Hypothesis 3
Non-Hispanic White	1260 (86.78)	661 (87.32)	378 (84.94)	514 (88.01)
Hispanic	131 (9.02)	68 (8.98)	49 (11.01)	47 (8.05)
African-American	34 (2.34)	16 (2.11)	11 (2.47)	14 (2.40)
Asian-American	11 (.76)	3 (.4)	4 (.9)	4 (.68)
Other	16 (1.1)	9 (1.19)	3 (.67)	5 (.86)
Gender				
Female	1554 (88.35)	790 (88.66)	478 (89.01)	630 (88.98)
Male	205 (11.65)	101 (11.34)	59 (10.99)	78 (11.02)
Age	18.31 (7.2)	17.81 (6.58)	17.53 (6.45)	18.96 (7.3)
< 18 Years old	1281 (72.83)	678 (76.09)	423 (78.77)	477 (67.37)
18–25 Years old	317 (18.02)	155 (17.4)	76 (14.15)	154 (21.75)
26 Years and older	161 (9.15)	58 (6.51)	38 (7.08)	77 (10.88)
Primary diagnoses				
Other mood disorder	449 (25.61)	253 (28.46)	112 (20.97)	138 (19.49)
Major Depressive Disorder	426 (24.3)	234 (26.32)	151 (28.28)	167 (23.59)
Bipolar Disorder	199 (11.35)	75 (8.44)	59 (11.05)	103 (14.55)
Eating Disorder	21 (1.2)	3 (.34)	2 (.37)	5 (.71)
Anxiety Disorder	38 (2.17)	13 (1.46)	6 (1.12)	16 (2.26)
Other Disorder	620 (35.37)	311 (34.98)	204 (38.2)	279 (39.41)
Number of diagnoses	3.65 (1.63)	3.34 (1.67)	4.06 (1.51)	4.19 (1.40)
Number of NSSI methods	3.76 (2.6)	3.74 (2.63)	4.23 (2.87)	3.66 (2.46)

Note: All values are n (%) except for age and number of diagnoses, which are $M(SD)$.

assessment was used; data from a total of 891 patients were included in these analyses.

To identify if functions change over time within an individual, NSSI functions were examined in individuals who were admitted twice and assessed both times with the ISAS-SF using paired samples *t*-tests and, when considering covariates, repeated measures ANOVA. We evaluated the same potentially relevant demographic and clinical covariates for inclusion in these analyses as for those for hypothesis 1, as well as the duration of time between assessments. For this second hypothesis, analyses were conducted using data from patients who provided information regarding their NSSI functions on at least two different admission assessments. For patients with data on more than two admission assessments, the first and last available data at the time of admissions were used; data from a total of 538 patients were included in these analyses. These assessments took place a median of 22 days apart ($M=136.6$, $SD=249.6$). We limited our analyses to admission dates to avoid conflating changes in NSSI functions over time with changes in NSSI frequency from treatment intake to treatment discharge.

For the final hypothesis, we explored how NSSI function changes over the course of treatment were associated with functional improvement. For these analyses, patients who provided data on NSSI functions at admission and discharge for at least one hospital stay were included. For patients who changed level of care during their treatment (e.g., transfer to inpatient care), multiple sets of admission and discharge data were reduced into a single treatment episode. For patients who had two separate treatment episodes (i.e., discharge and subsequent re-admission is at least 30 days apart), only the data from the first treatment episode were used. Data from 709 patients were included in these final analyses. Potential covariates were identical to those considered for hypothesis 2. For preliminary analyses, paired-samples *t*-tests and Pearson's correlations were used; for analyses controlling for relevant covariates, partial correlations and repeated measures ANOVAs were used.

Given that different assessments were provided to patients at different times, and only some patients provided data at two or more time points, the samples used to examine the specific questions did not entirely overlap. Although these samples did not differ significantly in racial or gender distributions, or in the most common NSSI methods (cutting and severe scratching), significant differences were found across the samples with regard to age, number of diagnoses, and number of NSSI methods used in the past year. For age, the sample used for hypothesis 3 had a mean age that was older than the mean age in samples used for hypotheses 1 and 2. For number of diagnoses, the sample used for hypothesis 1 had significantly fewer diagnoses than the samples used for hypotheses 2 and 3. For number of NSSI methods, the sample used for hypothesis 2 reported significantly more methods than the samples used for hypotheses 1 and 3. Further details on these descriptive characteristics can be found in Table 1.

Because statistical analyses varied by question of interest, all results reported here are reported using the original statistical results as well as the Cohen's *d* measure of effect size (Cohen, 1988). Cohen's *d*s between .3 and .5 are generally considered "small" effects, while effects ranging from .5 to .8 are considered of "medium" size, and effects greater than .8 generally considered of "large" effect.

3. Results

3.1. Hypothesis 1: NSSI functions and NSSI duration

Consistent with previous studies, patients endorsed internal functions to a greater degree than social functions on the ISAS-SF (paired-samples $t(890)=53.36$, $d=1.87$, $p<.001$).

Social functions of NSSI were not significantly associated with age, gender, or ethnicity. Internal functions were also unrelated to age; however, these functions were endorsed to a significantly greater extent among women compared to men (independent-samples $t(119)=4.77$, $d=.54$, $p<.001$) and Caucasians compared to non-Caucasians (independent-samples $t(755)=2.32$, $d=.24$, $p=.02$). Duration of NSSI was significantly correlated with age ($r=.82$, $d=2.91$, $p<.001$), and was significantly greater among women compared to men (independent-samples $t(193)=2.66$, $d=.23$, $p=.008$) and Caucasians compared to non-Caucasians (independent-samples $t(269)=5.32$, $d=.44$, $p<.001$). Craving for NSSI was significantly associated with both internal ($r=.44$, $d=.98$, $p<.001$) and social ($r=.16$, $d=.32$, $p<.001$) functions; however, recent NSSI frequency (in the preceding week) was not associated with either type of NSSI function. Because of these associations, gender, ethnicity, urges for NSSI, and age were included as covariates in subsequent analyses using partial correlations.

Social functions of NSSI were not associated with duration of

NSSI after adjusting for demographic characteristics and urge for NSSI (partial $r=-.004$, $d=-.008$, $p=.91$). Internal NSSI functions were also not significantly associated with NSSI duration when adjusting for these covariates (partial $r=.06$, $d=.12$, $p=.14$).

In order to understand whether these results were driven by outliers with extremely long or short NSSI histories, we subsequently dichotomized patients into those with less than one year of NSSI history ("short history", $n=100$, 11.2%) and those with greater than 1 year of NSSI history ("long history", $n=791$, 88.8%). This cutoff was selected given the proposed diagnostic criteria for NSSI Disorder in DSM-5 (American Psychiatric Association, 2013), in which NSSI behaviors over the course of one year are considered relevant to the diagnosis. These groups did not differ by gender, racial/ethnic distribution, NSSI craving, or past-week NSSI frequency; however, patients with a 1 year or greater NSSI history were, on average, significantly older (independent-samples $t(448)=8.16$, $d=.59$, $p<.001$). After adjusting for age, no relationship was found between short and long NSSI duration for the social functions of NSSI (partial $r=.006$, $d=.01$, $p=.86$); however, duration remained associated with internal NSSI functions (partial $r=.15$, $d=.29$, $p<.001$). This relationship remained significant after further adjusting for number of NSSI methods (partial $r=.11$, $d=.22$, $p=.001$), but was no longer significant after adjusting for past year NSSI frequency (rank-transformed) over the preceding year (partial $r=.08$, $d=.17$, $p=.1$).

3.2. Hypothesis 2: NSSI functions across time

Patients reported higher overall levels of internal functions than social functions at both first (paired-samples $t(537)=36.64$, $d=1.61$, $p<.001$) and last admission (paired-samples $t(537)=38.19$, $d=1.72$, $p<.001$). Both types of functions were significantly correlated within individuals across time (internal: paired samples $r=.56$, $d=1.36$, $p<.001$, social: paired samples $r=.48$, $d=1.09$, $p<.001$). Both types of functions also decreased significantly across time (social: paired-samples $t(537)=4.48$, $d=-.19$, $p<.001$; internal: paired-samples $t(537)=-3.30$, $d=-.14$, $p=.001$), and there was no significant difference in the magnitude of decrease over time based on type of function (paired-samples $t(537)=.17$, $d=.007$, $p=.87$).

In order to evaluate potential covariates, a change score was calculated for each type of function by subtracting that function score at first assessment from that function score at last assessment. These change scores were then correlated with the change scores for NSSI craving and for past-week NSSI frequency, as well as age at first assessment and the number of days between assessments. NSSI function change scores were also compared across gender and ethnic groups. There were no significant relationships between the social function changes and the length of time between assessments, changes in NSSI past-week frequency, changes in NSSI craving, ethnicity, or gender. Changes in social functions were related to age at first assessment ($r=.09$, $d=.17$, $p=.049$). For internal functions, there was no relationship between changes over time and length of time between assessments, changes in NSSI past-week frequency, gender, ethnicity, or age; however, the internal functions change score was significantly associated with changes in NSSI craving ($r=.28$, $d=.58$, $p<.001$).

To evaluate whether decreases in social functions over time remained statistically significant after controlling for age, a repeated measures ANOVA was conducted. These results indicated that, after adjusting for age, there remained a significant decrease in NSSI social functions from first to last assessment, $F(1, 535)=11.69$, $p=.001$. For internal functions, however, the repeated measures ANOVA demonstrated that the decrease in NSSI internal functions was not significant after controlling for change in NSSI craving, $F(1, 533)=1.06$, $p=.30$.

3.3. Hypothesis 3: NSSI functions and treatment outcome

3.3.1. NSSI function changes during treatment

At admission to treatment, patients endorsed internal NSSI functions to a significantly greater extent than social functions (paired-samples $t(708)=38.45$, $d=1.48$, $p<.001$). By treatment discharge, both types of NSSI functions had decreased, and patients continued to endorse internal functions to a greater extent than social functions (paired-samples $t(707)=35.10$, $d=1.40$, $p<.001$). Both types of functions at admission were significantly correlated with the same function at discharge (internal: paired-samples $r=.53$, $d=1.23$, $p<.001$; social: paired-samples $r=.46$, $d=1.04$, $p<.001$); however, in both cases, the decrease in each function's mean level of endorsement over time was also significant (social: paired-samples $t(707)=5.71$, $d=-.22$, $p<.001$; internal: paired-samples $t(708)=6.86$, $d=-.26$, $p<.001$). The decrease in internal functions was significantly greater than the decrease in social functions (paired-samples $t(707)=2.99$, $d=.12$, $p=.003$).

Potential covariates considered for these analyses included duration of time in treatment, changes in past-week NSSI frequency during treatment, age, gender, and ethnicity. Changes in social functions during treatment were not associated with duration of treatment or changes in past-week NSSI frequency, nor did these changes differ significantly across gender or ethnic groups; however, changes in social functions were associated with age at admission ($r=.09$, $d=.19$, $p=.01$). Changes in internal functions were not significantly associated with any of the potentially relevant covariates. The results from a repeated measures ANOVA showed that, after adjusting for age, there remained a significant decrease in NSSI social functions from admission to discharge, $F(1, 705)=18.85$, $p<.001$.

3.3.2. NSSI functions and treatment outcomes

As expected, quality of life significantly improved (paired-samples $t(686)=22.29$, $d=.85$, $p<.001$) and the urge to engage in NSSI significantly decreased (paired-samples $t(684)=-17.73$, $d=-.68$, $p<.001$) from admission to discharge. Decreases in social functions of NSSI were associated with increases in QOL ($r=-.09$, $d=-.17$, $p=.02$), but not with decreases in NSSI urge ($r=.003$, $d=.006$, $p=.94$). Decreases in internal functions of NSSI were associated both with increases in QOL ($r=-.26$, $d=-.54$, $p<.001$) and with decreases in NSSI urge ($r=.28$, $d=.58$, $p<.001$).

Changes in QoL and craving were not associated with number of days in treatment, age at admission, or gender. Changes in QoL

and craving were significantly correlated with changes in past-week NSSI frequency (QoL change: $r=-.14$, $d=.27$, $p<.001$; craving change: $r=.25$, $d=.52$, $p<.001$). Decrease in craving was significantly greater for Caucasian patients when compared with non-Caucasian patients (independent-samples $t(566)=2.67$, $d=.34$, $p=.008$).

The relationship between decreases in social functions and increases in QoL remained significant after controlling for changes in NSSI frequency and age at admission (partial $r=-.09$, $d=.18$, $p=.02$), and the relationship between social functions and NSSI craving remained non-significant after controlling for change in NSSI frequency, age at admission, and ethnicity. The relationship between changes in internal functions and QoL remained significant after controlling for changes in NSSI frequency ($r=-.26$, $d=.54$, $p<.001$), and the relationship between changes in internal functions and craving remained significant after controlling for changes in NSSI frequency and ethnicity ($r=.26$, $d=.53$, $p<.001$).

3.3.3. Exploratory analyses

In order to clarify the associations between types of NSSI functions and specific types of treatment outcomes, we conducted exploratory analyses of the association between changes in the ISAS-SF subscales and changes in QoL and NSSI urge over the course of treatment (see Table 2). These subscales included five internal functions (affect regulation, anti-dissociation, anti-suicide, marking distress, self-punishment) and eight social functions (autonomy, interpersonal boundaries, interpersonal influence, peer bonding, revenge, self-care, sensation seeking, toughness).

Each of the 13 subscales of the ISAS-SF was significantly correlated with itself across time (paired samples $r_s=.29$ to $.55$, $p_s<.001$). Twelve of the 13 subscales decreased to a small, albeit statistically significant, degree over time, with the greatest decreases in endorsement of the affect regulation (paired-samples $t(699)=-6.54$, $d=.25$, $p<.001$) and interpersonal boundaries functions (paired-samples $t(704)=6.49$, $d=.25$, $p<.001$). Endorsement of the interpersonal influence subscale did not change significantly over time (paired-samples $t(697)=-.23$, $d=-.02$, $p=.82$).

Increases in QoL were significantly associated with decreases in the NSSI functions of self-punishment, affect regulation, anti-dissociation, marking distress, anti-suicide, and interpersonal boundaries ($r_s=-.1$ to $-.22$, $d_s=-.19$ to $-.44$, $p_s=.01$ to $<.001$). These relationships remained statistically significant after controlling for changes in NSSI frequency, age at admission, and patient ethnicity with the exception of interpersonal boundaries,

Table 2
Changes in ISAS-SF subscale scores and treatment outcomes.

ISAS-SF subscale	Change over time			QoL			Urge		
	<i>t</i> (<i>df</i>)	<i>d</i>	<i>p</i>	<i>r</i>	<i>d</i>	<i>p</i>	<i>r</i>	<i>d</i>	<i>p</i>
Affect regulation	6.54 (699)	.25	<.001	-.21	-.43	<.001	.24	.5	<.001
Interpersonal boundaries	6.49 (704)	.25	<.001	-.10	-.19	.01	.06	.11	.15
Self-punishment	5.32 (696)	.20	<.001	-.22	-.44	<.001	.23	.48	<.001
Self-care	3.20 (702)	.13	.001	-.03	-.07	.4	-.04	-.09	.25
Anti-dissociation	6.35 (700)	.24	<.001	-.20	-.4	<.001	.21	.44	<.001
Anti-suicide	2.87 (702)	.10	.004	-.12	-.25	.001	.14	.28	<.001
Sensation-seeking	3.60 (704)	.12	<.001	-.07	-.15	.05	-.02	-.03	.65
Peer bonding	2.65 (702)	.09	.008	.009	.02	.8	-.07	-.14	.07
Interpersonal influence	-.23 (697)	-.02	.82	-.06	-.12	.11	-.03	-.06	.4
Toughness	4.54 (698)	.17	<.001	-.06	-.11	.13	.06	.11	.14
Marking distress	3.25 (703)	.12	.001	-.15	-.3	<.001	.14	.28	<.001
Revenge	4.42 (699)	.18	<.001	-.07	-.14	.07	.04	.08	.33
Autonomy	2.43 (640)	.10	.02	-.06	-.11	.15	.09	.17	.03

Note: QoL=quality of life, urge=NSSI urge. Because increased QoL scores and decreased urge scores are indicative of a positive treatment outcome, negative Cohen's *d*s in the "QoL" column indicate that decreases in an NSSI function are associated with improved QoL (positive treatment outcome), while negative Cohen's *d*s in the "urge" column indicate that decreases in an NSSI function are associated with increased urge (negative treatment outcome).

which was no longer statistically significant after controlling for these variables. Decreases in NSSI urge were also significantly associated with decreases in the NSSI functions of affect regulation, self-punishment, anti-dissociation, anti-suicide, marking distress, and autonomy ($r_s = .09$ to $.24$, $d_s = .17$ to $.5$, $p_s = .03$ to $< .001$). These results remained consistent after controlling for changes in NSSI frequency, age at admission, and patient ethnicity, with the exception of changes in the autonomy subscale, which was no longer significantly related to changes in NSSI urges after controlling for these variables.

4. Discussion

For most people, the very idea of self-injury is inherently aversive. Yet, nearly one in five people choose to injure themselves at some point in their lives, usually during middle or late adolescence (Klonsky, 2011; Whitlock et al., 2006). While NSSI can often become a longstanding and severe clinical problem (Muehlenkamp, 2005), roughly 25–30% of individuals who try NSSI do so only once (Muehlenkamp et al., 2009; Whitlock et al., 2006). Understanding the functions behind NSSI is essential for not only characterizing the course and prognosis of NSSI, but also for assessing and identifying important treatment goals for people who self-injure (Washburn et al., 2012b).

In this set of analyses, we sought to answer three key questions about NSSI functions in a large sample of adolescents and adults seeking treatment for self-injurious behaviors. First, we hypothesized that individuals with a more chronic course of NSSI would report greater internal NSSI functions (hypothesis 1). We found that social functions were not associated with NSSI duration, and, while greater endorsement of internal functions of NSSI was associated with increased duration of NSSI in bivariate analyses, this result was small in magnitude and was no longer statistically significant after adjusting for associated demographic and clinical characteristics. These findings indicate that, within a sample of individuals engaging in NSSI at a level of severity warranting acute treatment, NSSI functions do not significantly vary by self-reported duration of NSSI. Of note, however, internal NSSI functions differed significantly between patients with less than a year of NSSI versus one year or greater, suggesting that, while changes in overall duration may not be strongly associated with NSSI functions, internal functions may become more predominant as patients transition from an earlier, more exploratory period of NSSI into a more chronic and entrenched period of NSSI, consistent with Chapman's (2006) experiential avoidance model. Interestingly, this relationship was no longer significant after adjusting for NSSI frequency, suggesting that NSSI severity, as defined by frequency, may play a role in the limited association between NSSI duration and internal functions. These results suggest only partial support for hypothesis 1. Additional longitudinal work will also be needed to clarify whether changes in NSSI frequency and exposure lead to changes in NSSI functions, whether increased use of NSSI for internal functions leads to increases in NSSI behaviors, or whether some other construct, such as depression, contributes to changes in both. Future research on this question would benefit from the inclusion of individuals with lower-severity NSSI who are closer to the initial onset of the behaviors.

We further hypothesized that patients would report decreases in NSSI functions between two admissions assessments, and that these decreases would be greatest for internal NSSI functions (hypothesis 2). If these functions do differ over time in the hypothesized way, NSSI early intervention and later intervention targets may need to be different, with, for example, early intervention programs focusing on social functions and other intervention programs focusing on internal functions. Our data

indicated that both types of NSSI functions (internal and social) were highly stable within individuals across time. Interestingly, there were also significant decreases in both types of functions over time ($d_s = -.14$ to $-.19$); however, the magnitude of these decreases were substantially smaller than the magnitude of the stability of functions across time, and did not differ significantly based on type of function. Further, the decrease in internal NSSI functions was no longer statistically significant after controlling for NSSI craving, a measure of NSSI severity.

These results suggest that, in general, an individual's reasons for engaging in NSSI – be it changing internal states or influencing social situations – are likely to stay relatively similar as they continue to engage in NSSI. This provides support for existing measures that do not distinguish between early and later functions of NSSI (e.g., ISAS) as well as suggesting that state changes in mood or NSSI severity should not be major confounds to NSSI functional assessment. Only one functional assessment of NSSI specifically includes items addressing NSSI functions both at behavior onset and at the time of the assessment (OSI; Nixon and Cloutier (2005)); unfortunately, no data addressing how these functions behave over time has been published using this particular assessment.

Our findings also suggest that there is a small, but consistent decrease in endorsement of NSSI functions across time, consistent with results from previous work in non-clinical samples (Glenn and Klonsky, 2011; You et al., 2013). This could be due to consolidation of perceived functions over time; for example, a person may initially endorse several internal or social functions to a moderate degree when engaging in NSSI, but ultimately continue to engage in NSSI focusing on only a specific subset of these functions for which NSSI is most effective. It is also possible that patients develop certain NSSI functions over time that we are not currently assessing, such as the positive physical feelings associated with the release of endogenous opioids (Sher and Stanley, 2008), which may replace other functions that are endorsed when NSSI is less habitual. Future research is needed to clarify these relationships by investigating more specific functions of NSSI within the umbrella categories of internal and social functions. Additionally, it will be important to understand the relationship between changes in internal NSSI functions and NSSI craving, given that the decrease in internal functions over time was not significant after controlling for craving, and whether decreases in craving impact NSSI functions, changes in functions impact craving, or some other variable (such as psychiatric symptoms) impacts both functions and craving simultaneously.

Finally, we evaluated how changes in NSSI functions within an individual over the course of one treatment stay are associated with clinical outcomes, hypothesizing that decreased in both internal and social functions would be associated with greater clinical improvement (hypothesis 3). We found that both internal and social functions are relatively stable over the course of treatment, while exhibiting small decreases by the time of discharge from treatment, similar to findings for hypothesis 2 above. Decreases in internal functions of NSSI were significantly associated with improved quality of life and decreased NSSI urge over the course of treatment, even after considering a variety of potential covariates, such as recent NSSI frequency, duration of treatment, and demographics. Exploratory analyses investigating the ISAS-SF subscales suggested that these results are applicable to a broad range of internally-focused NSSI functions, rather than attributable to a specific type of internal function. Decreases in social functions of NSSI were associated with improved quality of life, but not changes in urges for NSSI, and these results remained after considering relevant covariates.

These results suggest several possibilities. First, it may be that changes in internal NSSI functions are causally associated with

improved treatment outcomes. Through the process of treatment, patients may identify that NSSI is not as useful to them in solving internal problems (for example, NSSI used for affect regulation may ultimately make the patient feel worse) and may then find that they crave NSSI less and, relatedly, experience improved quality of life due to decreased NSSI urge and increased insight into their behaviors. It is also possible that causality runs in the alternate direction; patients with improved quality of life may perceive that they “need” NSSI less, reducing their self-reported urge and NSSI functions. It may also be that a third variable, such as development of alternative coping strategies and skills to manage negative mood and self-criticism, results in improved quality of life, decreased urge for NSSI, and decreased reporting of NSSI internal functions. With respect to social functions, it is similarly possible that these functional changes may be the cause of, or caused by, changes in quality of life; it is also possible that third variables (such as improved social or communication skills) could both decrease social NSSI functions and increase quality of life.

Given these potential mechanisms, it is interesting that changes in social functions were not associated with changes in NSSI urge, especially when considering the significant relationship between quality of life and urge scores at admission ($r = -.38$, $d = -.82$, $p < .001$). Post-hoc analyses demonstrated that, at admission, internal functions of NSSI were strongly associated with NSSI urge ($r = .43$, $d = .96$, $p < .001$), while social NSSI functions were unrelated to NSSI urge ($r = .0001$, $d = .001$, $p = .99$). This suggests that NSSI urge is most commonly experienced among individuals who are using NSSI to regulate internal states, and would therefore be unlikely to change along with more external, social NSSI functions.

Taken together, these findings further underscore that internal and social NSSI functions are relatively stable across time and treatment. There are some small decreases in the endorsement of these functions over time, which could be associated with consolidation of NSSI functions, clinical improvement, or the development of alternative, as yet unexplained NSSI functions, such as the production of physiological responses associated with endogenous opioids. These findings provide support for our current models of NSSI functions and for the focus of prevention and intervention programs on the most common NSSI functions (most typically, affect regulation), given their relevance throughout the course of NSSI engagement. Our results do suggest that changes in functions are related to functional outcomes, which supports the utility of clinicians assessing NSSI functions throughout treatment as a measure of clinical progress. Future research can help clarify these valuable results by investigating NSSI functions among individuals who are closer to the time of NSSI onset, as well as by specifically asking individuals to report on their reasons for beginning and for continuing NSSI. It will also be valuable to conduct research to determine whether changes in NSSI functions are a consequence or cause of clinical improvement, in order to help facilitate development of effective, NSSI-specific treatments.

There are several strengths and weaknesses of this study that are worthy of consideration. First, the samples were comprised of patients enrolled in a partial hospitalization and intensive treatment program designed specifically for NSSI; this type of sample ensures that our results are relevant to a particularly severe type of self-injurer, but may not be generalizable to the broader population of individuals engaging in NSSI in the community, including people who have only just recently begun engaging in NSSI but who do not yet exhibit behavior severe enough to warrant acute treatment. Future research should investigate whether these results are similar to those found in community settings, with a particular focus on investigating NSSI functions among individuals who only recently began engaging in NSSI.

Second, patients received treatment during the intervals in

which NSSI functions were being assessed; this permits us to investigate the impact of a particular treatment program on NSSI functions (hypothesis 3), but also reduces the relevance of our results to researchers and clinicians interested in the naturalistic course of NSSI functions (e.g., in the context of no NSSI-specific treatment). Although we attempted to control for the contribution of treatment to change in NSSI functions by only examining patients with two separate admissions, these analyses only provide a proxy for the naturalistic course of NSSI functions. Additionally, we are unable to control for the use of psychiatric medications during treatment or the exposure to other kinds of outside treatment (such as community-based treatment or enrollment in other treatment programs between assessments), which may be related to changes in NSSI functions. It is possible that patients exposed to certain kinds of treatment between assessments might see different patterns of changes in NSSI functions over time, when compared to patients with other kinds of treatment or no treatment between assessments. Further, patients who enrolled in the treatment program twice may be qualitatively different from patients who enrolled only once (e.g., they may be “non-responders” to this particular type of treatment) which may have impacted the results for those patients. For example, NSSI functions may be more resistant to change among these patients, leading to more evidence of NSSI function stability in this sample than what might be found in other samples who responded to treatment (or whose NSSI changed over time without exposure to any treatment). Future research should look in greater detail at the types and amount of treatment being provided to patients, and whether differences in treatment exposure or adherence impact NSSI functions.

Third, our results rely on self-reported reasons for engaging in NSSI; while this approach is common in the literature, we cannot conclude whether changes in reported functions are necessarily accurate or whether our findings would apply to other conceptualizations of NSSI functions (for example, the actual or anticipated consequences of the behaviors). Additionally, our self-report measure of NSSI frequency only inquired about episodes in the past year; as such, we were unable to control for lifetime NSSI frequency, which would be a more robust indicator of total exposure and habituation to NSSI than past year frequency.

Fourth, while some of our analyses used within-persons designs across two time points, our analyses regarding NSSI duration and functions (hypothesis 1) were cross-sectional in nature and, as a result, the direction of causality cannot be inferred. Additionally, while our longitudinal results (hypotheses 2 and 3) were not impacted by considering the length of time between assessments as a covariate, it is possible that the pattern of results would change were results considered across a much longer time frame (e.g., multiple years).

Finally, while some of our results were of medium effect (e.g., the relationships between internal function changes and clinical outcomes), many were statistically significant but small effects (Cohen's d s $< .3$). It will be important, then, to consider the potential of other variables that might explain changes in NSSI functions over time, for example, broader measures of psychopathology (such as depression and anxiety) as well as how functions might change in response to environmental and social contingencies (e.g., reinforcement from family or friends).

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References

- American Psychiatric Association, 2013. *Diagnostic and Statistical Manual of Mental disorders: DSM-5*. American Psychiatric Association, Washington, D.C.
- Bentley, K.H., Nock, M.K., Barlow, D.H., 2014. The four-function model of non-suicidal self-injury: key directions for future research. *Clin. Psychol. Sci.* 2, 638–656. <http://dx.doi.org/10.1177/2167702613514563>.
- Chapman, A.L., Gratz, K.L., Brown, M.Z., 2006. Solving the puzzle of deliberate self-harm: the experiential avoidance model. *Behav. Res. Ther.* 44, 371–394. <http://dx.doi.org/10.1016/j.brat.2005.03.005>.
- Cohen, J., 1988. *Statistical Power Analysis for the Behavioral Sciences*, Second ed. Lawrence Erlbaum Associates, Hillsdale, NJ.
- De Leo, D., Heller, T., 2008. Social modeling in the transmission of suicidality. *Crisis* 29, 11–19. <http://dx.doi.org/10.1027/0227-5910.29.1.11>.
- Endicott, J., Nee, J., Harrison, W., Blumenthal, R., 1993. Quality of life enjoyment and satisfaction questionnaire: a new measure. *Psychopharmacol. Bull.* 29, 321–326.
- Favazza, A.R., 1998. The coming of age of self-mutilation. *J. Nerv. Ment. Dis.* 186, 259–268. <http://dx.doi.org/10.1097/00005053-199805000-00001>.
- Glenn, C.R., Klonsky, E.D., 2009. Social context during non-suicidal self-injury indicates suicide risk. *Personal. Individ. Differ.* 46, 25–29. <http://dx.doi.org/10.1016/j.paid.2008.08.020>.
- Glenn, C.R., Klonsky, E.D., 2011. Prospective prediction of nonsuicidal self-injury: a 1-year longitudinal study in young adults. *Behav. Ther.* 42, 751–762. <http://dx.doi.org/10.1016/j.beth.2011.04.005>.
- Gratz, K.L., Tull, M.T., Levy, R., 2014. Randomized controlled trial and uncontrolled 9-month follow-up of an adjunctive emotion regulation group therapy for deliberate self-harm among women with borderline personality disorder. *Psychol. Med.* 44, 2099–2112. <http://dx.doi.org/10.1017/S0033291713002134>.
- ISSS, 2007. About Self-Injury. [Web page] Retrieved from www.issweb.org/aboutNSSI.php.
- Klonsky, E.D., 2007. The functions of deliberate self-injury: a review of the evidence. *Clin. Psychol. Rev.* 27, 226–239. <http://dx.doi.org/10.1016/j.cpr.2006.08.002>.
- Klonsky, E.D., 2009. The functions of self-injury in young adults who cut themselves: clarifying the evidence for affect-regulation. *Psychiatry Res.* 166, 260–268. <http://dx.doi.org/10.1016/j.psychres.2008.02.008>.
- Klonsky, E.D., 2011. Non-suicidal self-injury in united states adults: prevalence, sociodemographics, topography and functions. *Psychol. Med.* 41, 1981–1986. <http://dx.doi.org/10.1017/S0033291710002497>.
- Klonsky, E.D., Glenn, C.R., 2009. Assessing the functions of non-suicidal self-injury: psychometric properties of the inventory of statements about self-injury (ISAS). *J. Psychopathol. Behav. Assess.* 31, 215–219. <http://dx.doi.org/10.1007/s10862-008-9107-z>.
- Klonsky, E.D., Muehlenkamp, J.J., 2007. Self-injury: a research review for the practitioner. *J. Clin. Psychol.: Sess.* 63, 1045–1056. <http://dx.doi.org/10.1002/jclp.20412>.
- Klonsky, E.D., Olino, T.M., 2008. Identifying clinically distinct subgroups of self-injurers among young adults: a latent class analysis. *J. Consult. Clin. Psychol.* 76, 22–27. <http://dx.doi.org/10.1037/0022-006X.76.1.22>.
- Lindholm, T., Bjärehed, J., Lundh, L.G., 2011. Functions of nonsuicidal self-injury among young women in residential care: a pilot study with the swedish version of the inventory of statements about self-injury. *Cognit. Behav. Ther.* 40 (3), 183–189. <http://dx.doi.org/10.1080/16506073.2011.56579>.
- Linehan, M.M., Comtois, K.A., Brown, M.Z., Heard, H.L., Wagner, A., 2006. Suicide attempt self-injury interview (SASII): development, reliability, and validity of a tool to assess suicide attempts and intentional self-injury. *Psychol. Assess.* 18, 303–312. <http://dx.doi.org/10.1037/1040-3590.18.3.303>.
- Lloyd, E., Kelley, M.L., Hope, T., 1997. Self-mutilation in a community sample of adolescents: descriptive characteristics and provisional prevalence rates. In: *Presentation at the Annual Meeting of the Society for Behavioral Medicine*.
- Lloyd-Richardson, E.E., Perrine, N., Dierker, L., Kelley, M.L., 2007. Characteristics and functions of non-suicidal self-injury in a community sample of adolescents. *Psychol. Med.* 37, 1183–1192. <http://dx.doi.org/10.1017/S003329170700027X>.
- Menninger, K.A., 1938. *Man Against Himself*. Harcourt Brace, New York, NY.
- Muehlenkamp, J.J., 2005. Self-injurious behavior as a separate clinical syndrome. *Am. J. Orthopsychiatry* 75, 324–333.
- Muehlenkamp, J.J., Claes, L., Havertape, L., Plener, P.L., 2012. International prevalence of adolescent non-suicidal self-injury and deliberate self-harm. *Child. Adolesc. Psychiatry Ment. Health* 6, 10. <http://dx.doi.org/10.1186/1753-2000-6-10>.
- Muehlenkamp, J., Brausch, A., Quigley, K., Whitlock, J., 2013. Interpersonal features and functions of nonsuicidal self-injury. *Suicide Life-Threat. Behav.* 43, 67–80. <http://dx.doi.org/10.1111/j.1943-278X.2012.00128.x>.
- Muehlenkamp, J.J., Williams, K.L., Gutierrez, P.M., Claes, L., 2009. Rates of non-suicidal self-injury in high school students across five years. *Arch. Suicide Res.* 13, 317–329. <http://dx.doi.org/10.1080/13811110903266368>.
- Nixon, M.K., Cloutier, P., 2005. Ottawa Self-Injury Inventory (OSI-Clinical) (Published at) (http://www.insync-group.ca/publications/OSI_clinical_October_20051.pdf).
- Nock, M., 2009. *Understanding Nonsuicidal Self-Injury: Origins, Assessment, and Treatment*. American Psychological Association, Washington, DC.
- Nock, M.K., Prinstein, M.J., 2004. A functional approach to the assessment of self-mutilative behavior. *J. Consult. Clin. Psychol.* 72 (5), 885–890. <http://dx.doi.org/10.1037/0022-006X.72.5.885>.
- Nock, M.K., Prinstein, M.J., 2005. Contextual features and behavioral functions of self-mutilation among adolescents. *J. Abnorm. Psychol.* 114, 140–146. <http://dx.doi.org/10.1037/0021-843X.114.1.140>.
- Nock, M.K., Holmberg, E.B., Photos, V.L., Michel, B.D., 2007. Self-Injurious thoughts and behaviors interview: development, reliability, and validity in an adolescent sample. *Psychol. Assess.* 19, 309–317. <http://dx.doi.org/10.1037/1040-3590.19.3.309>.
- Sadeh, N., Londahl-Shaller, E.A., Piatigorsky, A., Fordwood, S., Stuart, B.K., McNeil, D. E., Yaeger, A.M., 2014. Functions of non-suicidal self-injury in adolescents and young adults with borderline personality disorder symptoms. *Psychiatry Res.* 216 (2), 217–222. <http://dx.doi.org/10.1016/j.psychres.2014.02.01>.
- Schwartz, R.H., Cohen, P., Hoffmann, N.G., Meeks, J.E., 1989. Self-harm behaviors (carving) in female adolescent drug abusers. *Clin. Pediatr.* 28, 340–346. <http://dx.doi.org/10.1177/000992288902800801>.
- Sher, L., Stanley, B.H., 2008. The role of endogenous opioids in the pathophysiology of self-injurious and suicidal behavior. *Arch. Suicide Res.* 12, 299–308. <http://dx.doi.org/10.1080/13811110802324748>.
- Turner, B.J., Chapman, A.L., Layden, B.K., 2012. Intrapersonal and interpersonal functions of non suicidal self-injury: associations with emotional and social functioning. *Suicide Life-Threat. Behav.* 42, 36–55. <http://dx.doi.org/10.1111/j.1943-278X.2011.00069.x>.
- Turner, B.J., Layden, B.K., Butler, S.M., Chapman, A.L., 2013. How often, or how many ways: clarifying the relationship between non-suicidal self-injury and suicidality. *Arch. Suicide Res.* 17, 397–415. <http://dx.doi.org/10.1080/13811118.2013.802660>.
- Victor, S.E., Klonsky, E.D., 2014. Correlates of suicide attempts among self-injurers: a meta-analysis. *Clin. Psychol. Rev.* 34, 282–297. <http://dx.doi.org/10.1016/j.cpr.2014.03.005>.
- Walsh, B., 2007. Clinical assessment of self-injury: a practical guide. *J. Clin. Psychol.: Sess.* 63, 1057–1068. <http://dx.doi.org/10.1002/jclp.20413>.
- Washburn, J.J., Juzwin, K.R., Styer, D.M., Aldridge, D., 2010. Measuring the urge to self-injure: preliminary data from a clinical sample. *Psychiatry Res.* 178, 540–544. <http://dx.doi.org/10.1016/j.psychres.2010.05.018>.
- Washburn, J.J., Klonsky, E.D., Styer, D.M., Gebhardt, M., Juzwin, K.R., Aldridge, D., Yourek, A., 2012a. Short-form of the inventory of statements about self-injury. In: *Poster presentation at the annual meeting of the International Society for the Study of Self-Injury*.
- Washburn, J.J., Potthoff, L.M., Juzwin, K.R., Styer, D.M., 2015. Assessing DSM-5 nonsuicidal self-injury disorder in a clinical sample. *Psychol. Assess.* 27, 31–41. <http://dx.doi.org/10.1037/pas0000021>.
- Washburn, J.J., Richardt, S.L., Styer, D.M., Gebhardt, M., Juzwin, K.R., Yourek, A., Aldridge, D., 2012b. Psychotherapeutic approaches to non-suicidal self-injury in adolescents. *Child. Adolesc. Psychiatry Ment. Health* 6, 14. <http://dx.doi.org/10.1186/1753-2000-6-14>.
- Whitlock, J., Eckenrode, J., Silverman, D., 2006. Self-injurious behaviors in a college population. *Pediatrics* 117, 1939–1948. <http://dx.doi.org/10.1542/peds.2005-2543>.
- Whitlock, J., Muehlenkamp, J., Purington, A., Eckenrode, J., Barreira, P., Abrams, G.B., Knox, K., 2011. Nonsuicidal self-injury in a college population: general trends and sex differences. *J. Am. Coll. Health* 59, 691–698. <http://dx.doi.org/10.1080/0744841.2010.529626>.
- Wolff, J., Frazier, E.A., Esposito-Smythers, C., Burke, T., Sloan, E., Spirito, A., 2013. Cognitive and social factors associated with NSSI and suicide attempts in psychiatrically hospitalized adolescents. *J. Abnorm. Child. Psychol.* 41, 1005–1013. <http://dx.doi.org/10.1007/s10802-013-9743-y>.
- You, J., Lin, M.P., Leung, F., 2013. Functions of nonsuicidal self-injury among chinese community adolescents. *J. Adolesc.* 36, 737–745. <http://dx.doi.org/10.1016/j.adolescence.2013.05.007>.
- Zanarini, M.C., Laudate, C.S., Frankenburg, F.R., Wedig, M.M., Fitzmaurice, G., 2013. Reasons for self-mutilation reported by borderline patients over 16 years of prospective follow-up. *J. Personal. Disord.* 27, 783–794. <http://dx.doi.org/10.1521/pedi.2013.27.115>.