



# The functions and addictive features of non-suicidal self-injury: A confirmatory factor analysis of the Ottawa self-injury inventory in a university sample

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## ABSTRACT

The Ottawa Self-Injury Inventory (OSI) is a comprehensive self-report measure of non-suicidal self-injury (NSSI). In an effort to build on past research and further validate the OSI, this study presents a confirmatory factor analysis of the OSI's subscales measuring the functions and addictive features of NSSI using a university sample. Participants were 316 university students aged 17–25 years (84.8% female) who had engaged in NSSI at least once in their lifetime. Consistent with past research, results confirmed the four-factor structure of the Functions items (Internal Emotion Regulation, Social Influence, External Emotion Regulation, Sensation Seeking), as well as the single-factor structure of Addictive Features items. Correlations calculated between the obtained factors and indicators of NSSI severity revealed that higher endorsement of NSSI's Internal Emotion Regulation functions, External Emotion Regulation functions, and Addictive Features were associated with more frequent lifetime NSSI, recent (past 6 months) NSSI, and greater distress regarding NSSI urges; greater endorsement of NSSI's Sensation Seeking functions was also linked with more frequent lifetime NSSI. Results provide further support for the OSI's psychometric properties in a university sample, and offer additional evidence for links between specific NSSI functions and addictive features and more severe manifestations of the behavior.

## 1. Introduction

Non-suicidal self-injury (NSSI) is the intentional, self-inflicted damage of bodily tissue (e.g., self-cutting, skin burning, head-banging) in the absence of suicidal intent, using methods not socially sanctioned (Nixon and Heath, 2009; Nock and Favazza, 2009). This behavior has garnered considerable empirical attention in recent years in light of its high prevalence among youth and young adults, including among community-based samples (Muehlenkamp et al., 2012). The sound and comprehensive assessment of NSSI is thus of critical importance, both as a means of supporting prevention and intervention efforts, and to ensure robust measurement of NSSI in research.

Beyond an assessment of the occurrence and frequency of the behavior, designing measures to capture various qualitative features of NSSI is necessary in order to elucidate explanatory mechanisms and factors underlying engagement in NSSI. One such qualitative feature includes NSSI's functions, which are the motivations that underlie or reinforce self-injury (Klonsky, 2007) or, more simply, the various

reasons why individuals report engaging in NSSI. Frameworks of varying breadth have been proposed to organize NSSI's functions, with no single model providing clear theoretical consensus to date. For instance, the Inventory of Statements About Self-injury (ISAS; Klonsky and Glenn, 2009) is a measure that evaluates functions of two types, distinguishing between intrapersonal functions (e.g., engaging in NSSI to stop suicidal thoughts, to punish oneself) and interpersonal functions (e.g., to fit in with others, to seek care or help from others). Conversely, the Functional Assessment of Self-Mutilation (FASM; Lloyd et al., 1997) has shown evidence of both a four-factor solution (i.e., automatic-negative/positive reinforcement and social-negative/positive reinforcement functions; Lloyd-Richardson et al., 2007; Nock and Prinstein, 2004) and, more recently, a two-factor solution reflecting intrapersonal and interpersonal functions (Klonsky et al., 2015). Alternative measures have shown evidence of three-factor (You et al., 2013) and five-factor solutions (Whitlock et al., 2014). The clinical significance of some of NSSI's functions is the source of comparatively greater consensus; there is increasing evidence that greater

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endorsement of emotion regulation (ER) functions (i.e., engaging in NSSI as a way to alleviate intense negative emotions) correlates with more severe and enduring NSSI behavior (Klonsky et al., 2015; Muehlenkamp et al., 2013). Unmistakably, these findings emphasize the importance of using comprehensive instruments which account for multiple functions of NSSI.

A second feature of NSSI that is gaining empirical interest is its potentially addictive nature, otherwise referred to as NSSI's addictive "features" in the literature (Nixon et al., 2002). The addictive features of NSSI, similar to features of disordered substance use, consist of signs suggesting that individuals have developed a certain degree of dependence on their NSSI behavior. This is typically characterized by having lost control over the use of NSSI, having built up notable tolerance to NSSI, and/or engaging in it despite negative consequences (Buser and Buser, 2013; Nixon et al., 2002). Albeit the focus of debate (see Victor et al., 2012), NSSI's addictive features have yielded empirical support, much of which stresses their purported clinical implications. Notably, greater endorsement of addictive features is associated with more frequent NSSI (Martin et al., 2013; Nixon et al., 2015), a longer duration of NSSI (Martin et al., 2013; Nixon et al., 2002; Whitlock et al., 2008), unintentionally severe injury (Buser et al., 2017), and comorbid suicidal ideation (Csorba et al., 2009). Recent research using an undergraduate sample ( $N = 957$ ) also suggests that greater endorsement of NSSI's addictive features (measured as one composite score) may be linked to specific developmental risk contexts, such as perceived paternal maltreatment (Martin et al., 2016a). These findings highlight a clear need for further research on, and reliable measurement of, NSSI's potentially addictive properties.

While other existing measures permit assessment of NSSI's functions, the Ottawa Self-Injury Inventory (OSI; Cloutier and Nixon, 2003; Martin et al., 2013) is, to our knowledge, the only self-report assessment of NSSI that offers detailed assessment of *both* NSSI's functions and addictive features. The OSI's Functions items were designed to assess a range of NSSI's functions that are consistent with the literature (Klonsky, 2007). The OSI's Addictive Features items were derived from DSM-IV-TR criteria on substance dependence (American Psychiatric Association, 2000). In addition, the OSI also measures the duration, frequency, methods, and other characteristics of NSSI behavior.

The measure was first developed by Cloutier and Nixon (2003) based on comprehensive literature review, clinical expertise, and insights from adolescent psychiatric inpatients. Following the scale's initial development, Martin and colleagues (2013) used exploratory factor analysis (EFA) using a university student sample ( $N = 149$ ) to investigate the underlying factor structures of the OSI's Functions and Addictive Features items. This EFA revealed a four-factor structure underlying the Functions scale's items, translating conceptually to four categories of motivations underlying NSSI behavior. These include: Internal ER functions, which reflect motivations to regulate emotions associated with internalizing symptoms, such as sadness, numbness, and suicidal ideation; Social Influence functions, which reflect motivations to elicit a response or change in social contexts; External ER functions, which reflect motivations to regulate emotions associated with externalizing symptoms, such as frustration or anger; and Sensation Seeking functions, which reflect motivations to achieve feelings of exhilaration or excitement. The second EFA revealed a single-factor solution underlying the Addictive Features items (Martin et al., 2013). Martin and colleagues (2013) also demonstrated convergent validity of the Functions and Addictive Features factors through conceptually consistent associations with the FASM (Lloyd et al., 1997), as well as concurrent validity through correlations with theoretically relevant constructs. For instance, Internal ER and External ER functions accounted for the most variance in symptomatic distress, whereas Social Influence and Sensation Seeking functions were linked with interpersonal dysfunction and risky behaviors, respectively. Higher scores on Addictive Features were also linked with more frequent NSSI over the lifetime, and with experiencing greater feelings of relief after

engaging in NSSI.

The OSI's Functions and Addictive Features factor structures have since been confirmed using confirmatory factor analysis (CFA) in a psychiatric inpatient sample of youth aged 10–20 years (Nixon et al., 2015), allowing verification of Martin and colleagues' (2013) initial models. The use of CFA to confirm EFA findings is an important means of cross-validating a scale's structure across independent samples (Worthington and Whittaker, 2006). Nixon and colleagues' (2015) CFA findings suggest that the OSI's original factor structure generalizes to adolescent clinical populations; however, the study's sample size ( $N = 94$ ) was notably small for CFA, seeing as guidelines recommend a minimum of 100 cases for such analyses (Kline, 1998; Worthington and Whittaker, 2006). This raises potential concerns regarding both the generalizability and replicability of Nixon and colleagues' CFA results. These findings would therefore benefit from replication in a larger sample. Additionally, confirmation of Martin and colleagues' (2013) original EFA model has yet to be undertaken in an independent and non-clinical young adult sample.

The current study aimed to corroborate previous factor analytic work on the OSI and to alleviate the limitations therein by conducting a CFA of the measure's Functions and Addictive Features items in a large, new sample of young adults attending university. We first hypothesized that the aforementioned factor structures identified through EFA by Martin and colleagues (2013) would be confirmed. To further establish the factors' concurrent validities, and to help clarify how NSSI's functions and addictive features correlate with indicators of NSSI severity, associations among the OSI factors and lifetime frequency of NSSI, recent engagement in NSSI, and distress regarding NSSI urges were also explored. We hypothesized that higher scores on the Functions factors, particularly Internal ER and External ER functions, as well as higher scores on the Addictive Features factor, would be associated with more severe NSSI behavior.

## 2. Method

### 2.1. Participants

A total of 1150 university undergraduates enrolled in introductory psychology courses at a Canadian university completed online questionnaires for a larger investigation. In order to participate, individuals were required to speak English and be between 17 and 25 years of age. From this initial sample, 335 (29.1%) participants reported having engaged in NSSI at least once in their lifetime, and were therefore eligible for inclusion in the present study. Two cases were removed due to incomplete data and 17 additional cases were excluded for not meeting tissue damage criteria of NSSI (e.g., reported engaging in self-harm exclusively in the form of substance abuse), resulting in a final sample of 316 participants. The majority of this final sample was female (84.8%), with a mean age of 19.37 years ( $SD = 1.53$ ). Participants identified as Caucasian (71.8%), Asian (14.9%), Middle Eastern (10.4%), Black (7.9%), First Nations/Métis (4.4%), Hispanic (1.9%) or other ethnicity (1.3%).

### 2.2. Measures

The *Ottawa Self-Injury Inventory* (OSI; Cloutier and Nixon, 2003) was used to measure lifetime NSSI engagement, NSSI's functions, NSSI's addictive features, and indicators of NSSI severity. The OSI version used in this study included a total of 66 items. It was modified slightly from its original version (e.g., by adding questions pertaining to lifetime NSSI behavior) to streamline survey administration; however, no modifications were made to the original Functions or Addictive Features items used in this study. Participants indicated lifetime NSSI engagement (yes/no) by responding to the question, "In your lifetime, have you purposefully injured yourself without the intention to kill yourself?" NSSI's functions were then assessed using 24 items, rated on a scale

from 0 to 4 (0 = *not a reason to self-injure*; 4 = *always a reason to self-injure*). Prior research (Martin et al., 2013) has shown that these 24 items yield four Functions subscales, as follows: Internal ER functions (eight items; e.g., *To relieve feelings of sadness or feeling "down"*); Social Influence functions (nine items; e.g., *To belong to a group*); External ER functions (three items; e.g., *To release frustration*); and Sensation Seeking functions (four items; e.g., *To experience a "high" like a drug high*). Prior research has demonstrated the construct and convergent validities of the Functions subscales, as well as their internal consistencies (Cronbach's  $\alpha$  = between 0.67 and 0.85; Martin et al., 2013). Addictive features of NSSI were evaluated via seven items (e.g., *Despite a desire to cut down or control this behavior, you are unable to do so*) scored on five-point scales (0 = *never*; 4 = *always*). Previous research has demonstrated the construct and convergent validity of the Addictive Features scale, as well as its internal consistency (Cronbach's  $\alpha$  = 0.87; Martin et al., 2013).

Three indicators of NSSI severity were also measured. Lifetime frequency of NSSI was assessed using the question "How frequently have you purposefully injured yourself in your lifetime?" Response options included: 1–3 times, 4–6 times, 7–10 times, and more than 10 times. Recent NSSI occurrence was determined by responses (yes/no) to the question "In the last six months, have you purposefully injured yourself without the intention to kill yourself?". Participants' levels of distress regarding NSSI urges was assessed using the item "When you get the urge to hurt yourself, the urge is very distressing", which was rated on a five-point scale (0 = *not at all*; 4 = *extremely*). The OSI was also used to measure additional NSSI characteristics (e.g., methods used) for descriptive purposes.

### 2.3. Procedure

Participants were recruited through a research participation program designed for students enrolled in introductory psychology courses. Participants were provided with a unique link to complete the online questionnaires at a time and location of their choice. Prior to starting the questionnaire, participants entered an anonymous 5-digit identification code and provided their informed consent. A list of psychological resources was presented at the end of study, and participants received course credit for their participation. Procedures were approved by the institution's Research Ethics Board.

### 2.4. Statistical analysis

Analyses were conducted in R (R Core Team, 2013). Two CFAs were conducted to confirm the four-factor structure of the OSI's Functions items (comprised of Internal ER, Social Influence, External ER, and Sensation Seeking functions) and the single-factor structure of the Addictive Features items, respectively. Weighted least squares (WLS) estimation with robust standard errors and fit statistics were used for both CFA models to accommodate the ordinal nature and multivariate non-normality of the data (Bovaird and Koziol, 2012). For the first CFA model, correlations among the four Functions factors were permitted. Correlations among the confirmed factors and each of the three indicators of NSSI severity were also calculated. A more conservative significance criterion of  $p < 0.01$  was used to determine significance of correlational analyses to protect against Type I error due to the number of analyses conducted. Finally, post-hoc Steiger's  $z$ -tests (<http://quantpsy.org/corrttest/corrttest2.htm>) were conducted to explore differences in the magnitude of obtained correlations across NSSI's functions.

## 3. Results

No variable was missing more than 2.10% of data, and data were missing at random (Little's MCAR test:  $\chi^2 = 1122.46$ ,  $df = 1092$ ,  $p = 0.26$ ). Thus, item level missing data were replaced using

**Table 1**

Descriptive statistics for Indicators of Non-Suicidal Self-Injury (NSSI) Severity.

Indicators of NSSI severity %	%	n
<i>Lifetime NSSI frequency</i>		
1–3 times	33.2	105
4–6 times	15.8	50
7–10 times	11.4	36
More than 10 times	38.9	123
<i>NSSI in past six months</i>		
Yes	37.6	118
No	62.4	196
<i>Distressed by NSSI urges</i>		
Not at all	11.4	36
Very little	11.1	35
Somewhat	27.2	86
Quite a bit	28.5	90
Extremely	21.8	69

Note.  $N = 316$ , except for lifetime NSSI frequency and NSSI in past 6 months ( $N = 314$ ).

Expectation Maximization (Tabachnick and Fidell, 2007), other than two cases with missing data for frequency of lifetime and recent NSSI, which remained missing in relevant analyses.

### 3.1. Preliminary analyses

The most commonly used methods of NSSI included cutting (70.6%), scratching (66.1%), and hitting (47.5%). Regarding lifetime NSSI frequency, over one-third of individuals (38.9%) reported engaging in NSSI more than ten times in their lifetime. Over one-third of individuals (37.6%) also reported engaging in recent NSSI behavior. Half of participants (50.3%) reported perceiving their urges to self-injure as "quite a bit" or "extremely" distressing (see Table 1 for complete descriptive statistics on indicators of NSSI severity).

### 3.2. NSSI's functions

The initial CFA model demonstrated moderate fit to the data ( $\chi^2(246) = 722.42$ ,  $p < 0.001$ ;  $\chi^2/df = 1.57$ ; CFI = 0.94; RMSEA = 0.06; SRMR = 0.08). However, one item (*to diminish feelings of sexual arousal*) did not load significantly on the Social Influence factor ( $p = 0.06$ ) and was thus removed in the revised model. Moreover, examination of modification indices showed that two items (*to stop me from thinking about ideas of killing myself* and *to stop me from acting out ideas of killing myself*) had significantly correlated errors. Given the theoretical and clinical justification for the association between the error terms for these two items, the model was further revised to permit correlated errors between them. This revised and final model yielded good model fit ( $\chi^2(223) = 581.64$ ,  $p < 0.001$ ;  $\chi^2/df = 1.39$ ; CFI = 0.95; RMSEA = 0.05, 95% CI = 0.05–0.06; SRMR = 0.07), and all items had significant path estimates ranging between 0.30 and 0.77 (see Table 2 for standardized factor loadings and descriptive statistics). Relevant items were averaged to create scores for the four Functions factors, which were then used in correlational analyses.

Correlations were calculated among the Functions factors and each of lifetime frequency of NSSI, recent NSSI behavior, and levels of distress regarding NSSI urges (see Table 3). The four Functions factors were significantly positively inter-correlated. Internal ER, External ER, and Sensation Seeking functions were each also significantly positively correlated with lifetime frequency of NSSI behavior, while the correlation between Social Influence and lifetime frequency was trivial in magnitude. Post-hoc Steiger's  $z$ -tests revealed a significantly stronger correlation between lifetime NSSI and Internal ER than with either External ER ( $z = 3.16$ ) or Sensation Seeking ( $z = 3.93$ ); External ER and Sensation Seeking were associated with lifetime frequency of NSSI at similar magnitudes ( $z = 0.81$ ). Internal ER and External ER functions

**Table 2**  
Item descriptives, standardized factor loadings and descriptive statistics for functions factors.

	M (SD)	Internal ER	Social Influence	External ER	Sensation Seeking
To stop me from thinking about ideas of killing myself	2.07 (1.30)	0.64			
To stop me from acting out ideas to kill myself	1.89 (1.32)	0.63			
To relieve feelings of sadness or feeling "down"	2.96 (1.36)	0.72			
To produce a sense of being real when I feel numb and "unreal"	2.57 (1.50)	0.63			
To stop feeling alone and empty	2.78 (1.42)	0.59			
To distract me from unpleasant memories	2.82 (1.45)	0.59			
To experience physical pain in one area, when the other pain I feel is unbearable	3.00 (1.52)	0.61			
To punish myself	3.09 (1.41)	0.52			
To get out of doing something that I don't want to do	1.23 (0.68)		0.56		
To belong to a group	1.12 (0.47)		0.42		
To get care and attention from other people	1.64 (1.03)		0.43		
To avoid getting in trouble for something I did	1.24 (0.70)		0.54		
To stop my parents from being angry at me	1.42 (0.95)		0.49		
To show others how hurt or damaged I am	1.53 (0.98)		0.41		
To stop people from expecting so much from me	1.49 (0.97)		0.67		
To change my body image and/or appearance	1.69 (1.19)		0.56		
To release anger	2.95 (1.47)			0.70	
To release frustration	3.05 (1.37)			0.71	
To release unbearable tension	3.28 (1.33)			0.77	
To provide a sense of excitement that feels exhilarating	1.64 (1.03)				0.56
To experience a "high" like a drug high	1.87 (1.23)				0.75
To prove to myself how much I can take	1.42 (0.88)				0.53
For sexual excitement	1.11 (0.49)				0.30
Cronbach's $\alpha$		0.84	0.75	0.77	0.63
M (SD)		2.65 (0.97)	1.42 (0.54)	3.09 (1.15)	1.51 (0.65)

Note. M = mean. SD = standard deviation. N = 316. ER = emotion regulation.

**Table 3**  
Correlations<sup>a</sup> among NSSI's Functions, NSSI's addictive features, and Indicators of NSSI Severity.

	1	2	3	4	5	6	7	8
1. Internal ER	–							
2. Social influence	0.34**	–						
3. External ER	0.54**	0.19**	–					
4. Sensation seeking	0.48**	0.41**	0.31**	–				
5. Addictive features	0.63**	0.18*	0.43**	0.44**	–			
6. Lifetime NSSI frequency	0.50**	–0.02	0.35**	0.30**	0.58**	–		
7. Recent NSSI behavior	0.26**	0.03	0.22**	0.14	0.31**	0.36**	–	
9. Distress regarding NSSI urges	0.26**	0.14	0.19**	<0.01	0.20*	0.11	0.01	–

Note. N = 316, except in analyses including lifetime NSSI frequency or recent NSSI (i.e., in past 6 months) where N = 314. NSSI = non-suicidal self-injury. ER = emotion regulation. To protect against Type I error, a more conservative alpha of  $p = 0.01$  was used to determine significance.

\* $p < 0.01$ . \*\* $p < 0.001$ .

<sup>a</sup> Pearson correlations were calculated to determine associations among Internal ER, Social Influence, External ER, Sensation Seeking, and Addictive Features. Point-biserial correlations were calculated to determine associations between the four functions factors, the Addictive Features scores, and recent NSSI. Spearman's correlations were calculated to determine the associations between the four Functions scales, the Addictive Features and each of recent NSSI and distress regarding NSSI urges.

were each significantly positively correlated with recent NSSI, and these correlations did not differ in magnitude ( $z = 0.77$ ). Correlations between recent NSSI and both Social Influence and Sensation Seeking functions were non-significant and trivial in magnitude. Internal ER and External ER were each positively associated with distress regarding NSSI urges, and these correlations did not differ in magnitude ( $z = 1.34$ ). Finally, correlations between each of Social Influence and Sensation Seeking functions and feeling distressed by NSSI urges were not significant and of trivial effect size.

### 3.3. NSSI's addictive features

A second CFA confirmed the single-factor structure of the OSI's Addictive Features items. The initial model demonstrated good fit to the data ( $\chi^2(14) = 58.79, p < 0.001; \chi^2/df = 1.05; CFI = 0.99; RMSEA = 0.05; SRMR = 0.04$ ). All seven items had significant path estimates ranging between 0.65 and 0.79 (see Table 4 for standardized factor loadings), and modification indices suggested no other revisions were needed. An Addictive Features score was calculated by averaging the seven items. Correlational analyses (Table 3) showed that Addictive Features were positively correlated with all four Functions factors. Post-hoc Steiger's z-tests revealed that the correlation with Internal ER was significantly stronger than with any other function ( $z$ 's between 3.11 and 8.30), and the correlation between Addictive Features and both External ER ( $z = 3.78$ ) and Sensation Seeking ( $z = 4.60$ ) were of greater magnitude than with Social Influence. Moreover, higher Addictive Features scores were associated with greater lifetime NSSI frequency, recent engagement in NSSI, and with being distressed by NSSI urges.

## 4. Discussion

This study extends previous research regarding the OSI's psychometric properties by confirming the factor structures of the Functions and Addictive Features scales in a large university sample of late adolescents and young adults. Current results corroborate both Martin and colleagues' (2013) original model (with minor adjustments), and Nixon and colleagues' (2015) confirmatory model obtained using a smaller, adolescent inpatient sample. Specifically, the four-factor structure of the Functions scale (Internal ER, Social Influence, External ER, and Sensation Seeking) was confirmed with the exception of one problematic item, which was removed from the final model. The item, "to diminish feelings of sexual arousal" did not load on the Social Influence factor. Even though sexual arousal can be deemed a socially relevant construct, the item ultimately describes a self-regulatory function (i.e., containment of sexual arousal) that is conceptually distinct from other items in the Social Influence factor which aim to eliciting a social change. It is worth noting that this item was also problematic in Nixon



**Table 4**  
Standardized factor loadings and descriptive statistics for addictive features factor.

	M (SD)	Addictive Features
The severity in which the self-injurious behavior occurs has increased (e.g., deeper cuts, more extensive parts of your body)?	2.22 (1.38)	0.82
If the self-injurious behavior produced an effect when started, you now need to self-injure more frequently or with greater intensity to produce the same effect?	1.93 (1.23)	0.81
The self-injurious behavior occurs more often than intended?	2.33 (1.21)	0.79
Important social, family, academic or recreational activities are given up or reduced because of this behavior?	1.88 (1.26)	0.75
This behavior or thinking about it consumes a significant amount of your time (e.g., planning and thinking about it, collecting and hiding sharp objects, doing it and recovering)?	1.99 (1.26)	0.73
You continue this behavior despite recognizing that it is harmful to you physically and/or emotionally?	2.43 (1.39)	0.66
Despite a desire to cut down or control this behavior, you are unable to do so?	1.85 (1.09)	0.65
Cronbach's $\alpha$		0.90
M (SD)		2.09 (0.99)

Note. N = 316. M = mean. SD = standard deviation.

and colleagues' (2015) study, suggesting it warrants removal in future uses of the OSI. Another detail worth mentioning is that the item "for sexual excitement" loaded only weakly (standardized factor loading = 0.30) onto the Sensation Seeking factor, especially compared to other items. Nixon and colleagues' (2015) CFA yielded a similar magnitude loading in their sample of inpatient youth (standardized factor loading = 0.31). This low factor loading is likely an artifact of few individuals endorsing high levels of this item as a motivation underlying their NSSI, which is confirmed by the item's mean in the current investigation ( $M = 1.11$ ;  $SD = 0.49$ ). Lastly, as hypothesized, results confirmed the unidimensional nature of the Addictive Features scale, in accordance with both prior exploratory and confirmatory research (Martin et al., 2013; Nixon et al., 2015).

Present results also provide evidence of concurrent validity through significant, conceptually consistent correlations of non-trivial magnitude among the Functions and Addictive Features factors and indicators of NSSI severity (i.e., lifetime frequency of NSSI, recent engagement in NSSI, and distress regarding NSSI urges). Regarding NSSI's functions, the general pattern of findings suggests that, compared to Social Influence and Sensation Seeking functions, higher scores on Internal ER and External ER functions were more strongly linked to more severe NSSI. This is consistent with past research (e.g., Klonsky et al., 2015; Muehlenkamp et al., 2013) showing that individuals who report engaging in NSSI to alleviate adverse emotions tend to display more clinically significant impairment, such as greater symptomatic distress (Martin et al., 2013), relational distress (Martin et al., 2016b), and suicidality (Nock and Prinstein, 2005). These individuals endorsing ER functions may therefore be more susceptible to developing deeply entrenched and severe patterns of NSSI behavior. Research also shows that, while interpersonal functions contribute more strongly to NSSI onset, ER functions are more strongly linked with NSSI maintenance (Muehlenkamp et al., 2013). Although we were unable to explore NSSI maintenance over time in this study, our finding that *only* Internal ER and External ER functions were associated with recent NSSI may suggest that ER difficulties are especially salient motivations for self-injurious behavior in early adulthood. Plausibly, young adults, in comparison to adolescents, may be less likely to engage in NSSI for social or sensation-seeking reasons given the decreasing importance of peer influences and risk-taking orientations at this age (Gardner and Steinberg, 2005). Interestingly, we also found the Sensation Seeking factor to be linked with more frequent NSSI over the lifetime (though to a lesser extent than Internal ER). This finding lends evidence to the notion that NSSI engagement, albeit most often negatively reinforced (i.e., by consequent reductions in negative emotions; Nock and Prinstein, 2004, 2005; Victor et al., 2012), can also persist through positive reinforcement (i.e., by consequent increases in positive sensations; Martin et al., 2013; Nixon et al., 2015; Nock and Prinstein, 2004).

Addictive Features were also linked most strongly with Internal ER functions and were most weakly associated with Social Influence functions. In line with the previous discussion, it is possible that

individuals who endorse Internal ER functions would be more likely to fall into compulsive patterns of NSSI engagement due to greater psychological vulnerability; however, further research on potential mechanisms underlying this association is needed. Likewise, higher scores on Addictive Features were linked with more frequent lifetime NSSI, recent engagement in NSSI, and feeling greater levels of distress regarding NSSI urges, which is consistent with past research linking addictive features with more severe NSSI (Csorba et al., 2009; Martin et al., 2013; Nixon et al., 2002; Whitlock et al., 2008). Although the clinical correlates of NSSI's potentially addictive nature seem salient, it remains unclear how and when such a dependency might develop. Future research ought to explore at which point along a continuum of NSSI severity one's likelihood of endorsing addictive features might increase (i.e., severity threshold). Likewise, it is important for future investigations to explore which specific risk factors may increase vulnerability for NSSI's addictive features.

As a final discussion point, given the current lack of consensus regarding a conceptual model of NSSI's functions, it is useful to consider how the OSI's Functions scale compares to other available instruments. Like the ISAS (Klonsky and Glenn, 2009) and the FASM (Lloyd et al., 1997), the OSI distinguishes between intrapersonal (Internal ER, External ER, and Sensation Seeking) and interpersonal (Social Influence) functions. Similar to the FASM (Lloyd et al., 1997), the OSI also offers a distinction between positively (Sensation Seeking) and negatively (Internal/External ER) reinforcing NSSI behavior at the intrapersonal level. One unique feature of the OSI, however, is its evaluation of three distinct types of intrapersonal functions, allowing distinctions between desires to downregulate internalizing emotions, downregulate externalizing emotions, and upregulate positive sensations. This distinction may bear both clinical and empirical relevance as a means of discerning which specific affective or emotion-related needs underpin young people's use of NSSI.

Despite the important results discussed above, this study is not without limitations. Given that data were collected online and via self-reports only, we could not control the testing environment of participants to protect against possible response biases. We were also unable to collect diagnostic information on participants, given the non-clinical nature of the sample. The majority (84.8%) of our participants were female, which limits the extent to which results may generalize to males. Shared-method variance is another potential study limitation given that the OSI was the sole measure used to conduct concurrent validity analyses, which may have resulted in an inflation of the magnitude of obtained correlations. Likewise, we were limited to using single items to assess NSSI severity. Finally, our use of cross-sectional data and a correlational design precludes the drawing of any causal conclusions from our results, though current findings nonetheless provide impetus for longitudinal and experimental methods as promising next steps.

Limitations notwithstanding, the current study contributes to the extant literature by offering further support for the psychometric

properties of the OSI. Our findings suggest the OSI can offer reliable assessment of NSSI behavior in university-based intervention settings. It offers detailed exploration of clinically-relevant aspects of NSSI behavior, such as NSSI's functions and addictive features, which can help inform differential treatment planning for young self-injurers. From a psychometric standpoint, future research would benefit from exploring the test-retest reliability of the OSI, which has yet to be investigated. Lastly, findings should stimulate continued empirical investigation of NSSI's functions and addictive features, as the field progresses toward a more fine-grained understanding of the mechanisms underlying the behavior.

### Conflicts of interest

None.

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