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Abstract

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Nonsuicidal Self-Injury and Suicidal Self-Injury: A Taxometric Investigation

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The present research examined the latent structure of self-injurious behavior (SIB) to determine whether suicidal self-injury (SSI) and nonsuicidal self-injury (NSSI) reflect categorically distinct types of SIB or dimensional variations of the same construct. Participants consisted of 1,525 female undergraduates across several universities in the United States who completed the Survey of College Mental Health and Well Being and endorsed a history of SIB. Empirically derived indicators representing intent to die, suicidal history, frequency of SIB, severity of SIB, and number of methods of SIB were submitted to three mathematically independent taxometric procedures. Results of multiple consistency tests converged to indicate that the latent structure of SIB is continuous, with individuals who engage in SSI and NSSI differing in degree rather than kind. The implications of these dimensional findings for the theoretical conceptualization, assessment, and treatment of SIB are discussed.

Keywords: taxometric; dimension; category; self-injury; suicide

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SELF-INJURIOUS BEHAVIOR (SIB) REFERS TO ANY ACTIVITY engaged in intentionally and with the knowledge that it may or will result in physical or psychological harm to the self (Nock, 2010; Whitlock, Eckenrode, & Silverman, 2006). Self-injurious behaviors are highly prevalent, with 19% to 25% of clinical populations, 13% to 45% of adolescents, and 15% of college students engaging in SIB (Briere & Gil, 1998; Brunner et al., 2007; Swannell, Martin, Page, Hasking, & St. John, 2014; Whitlock et al., 2011). SIBs also represent a serious public health problem, often leading to serious physical and psychological harm to the self-injurer and causing distress among their family and friends (Nock, 2010). Research suggests that once individuals begin to engage in SIB, it is often difficult to stop, and SIB can become frequent, with one study suggesting that more than 50% of psychiatric inpatients who engage in SIB average more than 50 SIB episodes per year (Nock & Prinstein, 2004).

Although clinicians often associate SIB with borderline personality disorder, SIB is known to occur in the context of a multitude of other psychological disorders, including anxiety disorders, major depression, conduct or oppositional defiant disorders, and substance abuse disorders (Nock, Joiner, Gordon, Lloyd-Richardson, & Prinstein, 2006). In fact, the most recent revision of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; American Psychiatric Association, 2013) lists SIB as a symptom

of borderline personality disorder and factitious disorders and notes that SIB can be present in individuals with diagnoses of posttraumatic stress disorder. Trichotillomania (hair-pulling) and excoriation (skin-picking) disorders can also be considered, by definition, specific types of SIB.

A review of the self-injury literature reveals disagreement among experts regarding how different types of SIB ought to be classified. Some researchers propose two distinct forms of SIB, nonsuicidal self-injury (NSSI) and suicidal self-injury (SSI), with NSSI reflecting deliberate, self-inflicted destruction of the body without intent to die, and SSI referring to SIB engaged in with the intent to end one's life (e.g., Csorba et al., 2009). Proponents of the typological classification of SIB suggest that several characteristics differentiate the two behaviors. At the forefront of the conjectured distinction between NSSI and SSI, and consistent with the labels used to describe the behaviors, is the presence or absence of suicidal intent. Some research suggests that only approximately 6% of individuals who engage in SIB believe death is a probable result of their behaviors and endorse a serious intent to die (Patton et al., 1997). In contrast, 59% to 72% of individuals who engage in SIB do not report any suicidal thoughts at the time of self-injury (Muehlenkamp, 2005). Studies also suggest that individuals who engage in SSI tend to utilize more severe/lethal forms of SIB and report more serious recent history of SIB than individuals engaging in NSSI (Csorba et al., 2009). In addition, SSI is associated with more frequent suicidal and self-injurious thoughts and behaviors than NSSI (Brunner et al., 2007; Csorba et al.), and individuals who have attempted suicide report engaging in a greater number of SIB methods than those who have not (Whitlock, Muehlenkamp, & Eckenrode, 2008; Zlotnick, Donaldson, Spirito, & Pearlstein, 1997). Research also suggests that the number of lifetime suicide attempts is positively correlated with the number of the different methods used to self-injure (Nock et al., 2006). Thus, suicidal intent, severity of SIB, and number of SIB methods engaged in are suggested to be useful means of distinguishing NSSI from SSI.

Although the categories of SSI and NSSI may seem intuitive and some evidence appears to support the utility of their distinction, other research raises concerns about whether the distinction truly reflects the existence of naturally occurring classes. For example, some experts have questioned whether an individual's intent during SIB can be reliably determined, noting that individuals who engage in SIB often report being ambivalent (i.e., not caring whether they live or die) while engaging in SIB (Brunner et al., 2014; Kapur, Cooper, O'Connor, &

Hawton, 2013). In addition, one study found that more than one-third of adults endorsed experiencing suicidal thoughts while engaging in NSSI (Klonsky, 2011).

The lack of clarity in the distinction between NSSI and suicidal behaviors is also evidenced by the strong correlation and apparent overlap between the two constructs. Specifically, some evidence suggests that the strongest risk for engaging in NSSI is a history of suicidal behavior and ideation (Brunner et al., 2007), and although more severe NSSI behaviors are associated with higher rates of suicidality, individuals who engage in NSSI (regardless of level of severity) exhibit significantly more suicidality than individuals who have never engaged in NSSI (Whitlock et al., 2008). In fact, NSSI was found to precede or co-occur with suicidal thoughts and behaviors in 61% of college students, leading researchers to suggest that NSSI may act as a "gateway" to suicidal behavior (Whitlock et al., 2013). Research also suggests that the distribution of scores on measures of suicidal intent tend not to evidence bimodal distributions as may be anticipated if individuals are categorically either suicidal or nonsuicidal (Kapur et al., 2013). Finally, efforts to distinguish SIB based on intent to die are complicated by the fact that individuals who engage in SIB frequently report multiple motivations for their actions (Scoliers et al., 2009; Swannell et al., 2008). These observations have led some researchers to conclude that SIB is likely a continuously distributed construct.

Whether SIB is most accurately conceptualized as comprised of multiple categories (e.g., NSSI and SSI representing distinct groups) or dimensionally distributed is an empirical question that has yet to be directly investigated. Understanding the latent structure of SIB is of critical importance as an accurate conceptualization of SIB informs SIB theory, research, assessment, diagnosis, and treatment (Meehl, 1995). Thus, the aim of the present study was to conduct the first investigation into the latent structure of SIB using taxometrics, which consists of a series of statistical procedures designed to discern the latent structure of entities. Based on the considerable conceptual overlap between NSSI and SSI, and concerns raised about using intent as a primary distinguishing factor, it was hypothesized that SIB would be characterized by a dimensional latent structure.

Method

PARTICIPANTS

Prospective participants consisted of 3,069 college students from eight universities across the United States who completed the Survey of College Mental

Health and Well Being (SCMHWB), a web-based survey administered by researchers at a northeastern university. Individuals selected to receive survey invitations were chosen via random sampling (Whitlock et al., 2006). SIB was assessed via the Non-Suicidal Self-Injury Assessment Test (NSSI-AT), a reliable and valid web-based questionnaire that assesses many aspects (e.g., form, frequency, function, severity, etc.) of SIB (Whitlock, Exner-Cortens, & Purington, 2014). Given that the aim of the present research was to examine whether SSI and NSSI are categorically distinct, participants were excluded from the analyses if they denied a history of SIB. Of the 3,069 individuals who were administered measures, 1,525 reported a positive history of SIB and completed all study requirements. The final sample was predominately female (71%, mean age = 21.41 years, $SD = 4.18$), and ethnicities were diverse and included individuals who identified as Caucasian (75.9%), Asian (8.9%), Hispanic (7.7%), Asian-American (6.1%), African-American (4.3%), Other (3.4%), Middle Eastern/East Indian (2.4%), American Indian (1.8%), and Pacific Islander/Native Hawaiian (0.1%). Table 1 provides information regarding reasons endorsed by participants for engaging in SIB, and Table 2 provides rates of psychopathology and diagnostic status endorsed by participants.

Table 1
Intent Endorsed for Engaging in Self-Injurious Behavior

Intent Item Endorsed	n	%
To cope with uncomfortable feelings	840	55.1
To relieve stress or pressure	742	48.7
To deal with frustration	614	40.3
To change my emotional pain into something physical	596	39.1
To feel something	444	29.1
To deal with anger	416	27.3
To distract me from other problems or tasks	342	22.4
To get control over my life	342	22.4
As self-punishment or to atone for sins	308	20.2
In hopes that someone would notice that something is wrong or so that others will pay attention to me	307	20.1
Because I get the urge and cannot stop it	294	19.3
Because it feels good	273	17.9
Because of my self-hatred	248	16.3
To get a rush or surge of energy	190	12.5
To help me cry	150	9.8
So I do not hurt myself in other ways	116	7.6
Other reasons	114	7.5
To create an excuse to avoid something else	73	4.8
To avoid committing suicide	72	4.7
Because my friends hurt themselves	37	2.4
As an attempt to commit suicide	36	2.4
As a way to practice suicide	27	1.8

Table 2
Participant Reports for Suffering from and Receiving Diagnoses of Psychological Disorders

	Suffered		Received Diagnosis	
	N	Percentage (%)	N	Percentage (%)
ADHD	132	8.7	83	5.4
Anorexia	164	10.8	53	3.5
Anxiety Disorder	268	17.6	180	11.8
Bipolar Disorder	65	4.3	39	2.6
Borderline Personality	25	1.6	7	0.5
Bulimia	124	8.1	41	2.7
Major Depressive Disorder	718	47.1	439	28.8
OCD	143	9.4	58	3.8
PTSD	55	3.6	35	2.3
Schizophrenia	7	0.5	2	0.1
Seasonal Affective Disorder	135	8.9	16	1
Substance Abuse	74	4.9	30	2
Other	54	3.5	30	2

Materials

The SCMHWB is an online survey designed to assess several facets of SIB, including lifetime frequency, current SIB status, age of onset, specific behaviors, severity, body parts affected, and help-seeking behaviors (Whitlock et al., 2006). As mentioned above, specific items chosen for use in this study (see Table 3) were taken from the (NSSI-AT) portion of the Survey of Student Well-Being. This measure was created by researchers at Cornell University and developed through literature review and interviews with individuals with a history of NSSI and health professionals. A recent examination of the validity and reliability of the NSSI-AT revealed that the measure possesses strong psychometric properties. Test-retest reliability after a 4-week interval ranged between .63 and .91, and the NSSI-AT exhibited nonsignificant correlations with unrelated constructs (binge drinking, number of sexual partners, and lifetime prescription drug use) and strong correlations ($p < .001$) with other measures of SIB (e.g., the Functional Assessment of Self-Mutilation), indicating that the measure provides an accurate, stable assessment of SIB, particularly in a college population (Whitlock et al., 2014).

INDICATOR SELECTION

Based on the results of previous research, five indicators were generated to distinguish SSI from NSSI: suicidal intent, history of suicidal behavior, frequency of SIB, number of methods used to self-injure, and severity of the SIB. Consistent with the

Table 3
Items Selected from the Survey of College Mental Health and Well Being to Serve as Indicators

Indicator	Response Scale/Coding	Indicator Range
1. Suicidal Intent		0-2
Was practicing or attempting suicide the primary reason you intentionally hurt yourself?	0=No, 1=Yes	
I intentionally hurt myself as a way to commit suicide.	0=No, 1=Yes	
2. History of suicidal behavior		0-7
Have you ever seriously considered or attempted suicide?	0=No, 1=Yes	
Which of the following best describes your experience? (Please check all that apply):		
a. I thought seriously about it.	0=No, 1=Yes	
b. I had a general plan but did not carry it out.	0=No, 1=Yes	
c. I had a method but did not carry it out.	0=No, 1=Yes	
d. I made a serious attempt but no medical intervention occurred.	0=No, 1=Yes	
e. I made a serious attempt that received medical attention.	0=No, 1=Yes	
3. Frequency of SIB		0-12
Approximately on how many total occasions have you intentionally hurt yourself?	0=once 1= 2-3 times 2=4-5 times 3=6-10 times 4=11-20 times 5=21-50 times 6= >50 times	
On average, how often do you SI while you are in your most active phases?	0=1x every 2 years or more 1=1x every year 2=1x every few months 3=1-3x per month 4=1x per week 5=2-3x per week 6=every day	
4. Number of methods used to self-injure		0-15
Have you ever...		
a. Cut wrists, arms, legs, torso or other areas of the body?	0=No, 1=Yes	
b. Dripped acid onto the skin?	0=No, 1=Yes	
c. Created salt and ice burns on the skin?	0=No, 1=Yes	
d. Carved words or symbols into the skin?	0=No, 1=Yes	
e. Ingested a caustic substance(s) or sharp object(s)?	0=No, 1=Yes	
f. Bitten yourself to the point that bleeding occurs or marks remain on skin?	0=No, 1=Yes	
g. Tried to break my own bone(s)?	0=No, 1=Yes	
h. Ripped or torn skin?	0=No, 1=Yes	
i. Performed self-asphyxiation (with the intention of hurting yourself)?	0=No, 1=Yes	
j. Burned wrists, hands, arms, legs, torso, or other areas of the body?	0=No, 1=Yes	
k. Rubbed glass into skin or stuck sharp objects into the skin?	0=No, 1=Yes	
l. Banged or punched objects to the point of bruising or bleeding?	0=No, 1=Yes	
m. Punched or banged oneself to the point of bruising or bleeding?	0=No, 1=Yes	
n. Mutilated genitals/rectum?	0=No, 1=Yes	
o. Engaged in fighting or other aggressive activities with the intention of getting hurt?	0=No, 1=Yes	
5. Severity of SIB		0-6
Have you ever Sled more severely than you expected?	0=No, 1=Yes	
Have you ever hurt yourself so badly that you should have been seen by a medical professional even if you were not?	0=No, 1=Yes	
How many times have you Sled more severely than you expected?	0=Never 1=1 2=2-3 3=4-5 4=More than 5	

recommendations of Ruscio et al. (2006), each indicator represented the summed score of two to five SCMHWB/NSSI-AT items that assessed the specific domain (see Table 3). In accordance with the recommendations of previous research (Meehl & Yonce, 1994), indicators had to exhibit low correlations within the conjectured groups (i.e., nuisance covariance) and high levels of validity (i.e., mean differences between the two conjectured groups of > 1.25 standard deviations).

DATA ANALYTIC STRATEGY

Three taxometric procedures—MAXimum Eigenvalue (MAXEIG; Waller & Meehl, 1998), Mean Above Minus Below a Curve (MAMBAC; Meehl & Yonce, 1994), and Latent-Mode Factor Analysis (L-Mode; Waller & Meehl, 1998)—were applied to the SIB indicators to evaluate the latent structure of SIB. Simulated taxonic and dimensional data plots were generated using Monte Carlo data that matched the unique distributional characteristics (i.e., skew, N , etc.) of the research data to aid in the interpretation of study results. Cases were assigned to groups using the mean base rate method, and two independent raters evaluated the data plots to ensure reliable interpretation of the plots. The algorithms for the taxometric procedures were obtained from Ruscio (2014).

MAXEIG

MAXEIG is a multivariate taxometric procedure that functions by calculating and plotting the first (largest) eigenvalue of all remaining indicators across successive overlapping windows of an input indicator. Categorical constructs generate MAXEIG graphs that convex upward in the areas with the greatest mixture of taxon and nontaxon members, whereas dimensional constructs generate relatively flat graphs. The MAXEIG procedure was conducted using an Inchworm Consistency Test (ICT), which repeats MAXEIG analyses on the research data with an increasing number of overlapping windows. The ICT improves the interpretability of plots and is particularly beneficial for elucidating the presence of a low base-rate taxon (Waller & Meehl, 1998). The ICT was performed using 100, 200, and 300 windows with .90 overlap.

MAMBAC

The MAMBAC procedure calculates and plots mean differences on an indicator above and below a sliding cut score on a second indicator and is based on the assumption that if two discrete groups exist, mean differences between groups will occur on valid indicators of group membership. Dimensional constructs generate plots that are relatively flat or concave in shape, whereas categorical constructs

produce plots that convex upward at the cut that most effectively discriminates between the two groups. MAMBAC analyses were conducted using 50 evenly spaced cuts beginning 25 cases from either extreme.

L-Mode

L-mode is a multivariate taxometric procedure that conducts a factor analysis on the proposed indicators, and plots the distribution of scores on the first principal factor. Taxonic variables tend to produce a bimodal distribution of factor scores. In contrast, dimensional variables generate factor score plots that are unimodally distributed.

CCFI Scores

In addition to the visual inspection and classification of plots, the relative fit of the research data curves to the simulated taxonic and dimensional curves was assessed using the Comparison Curve Fit Index (CCFI; Ruscio, Ruscio, & Meron, 2007). The CCFI provides an objective numerical gauge (ranging from 0 to 1) of whether data plots more closely match the simulated taxonic or simulated dimensional plots, with scores below .45 suggesting dimensional structure and scores above .55 supporting taxonic structure (e.g., Ruscio & Marcus, 2007; Ruscio, Walters, Marcus, & Kaczetow, 2010).

Results

Preliminary analyses confirmed that the SIB indicators were significantly correlated in the full sample, exhibited low nuisance correlations, and met minimum validity criteria ($> 1.25 SD$; see Tables 4 and 5). Thus, the indicators were deemed appropriate for taxometric analysis. Results also revealed that the raters agreed in their ratings of 25 of the 26 generated plots (96 percent; kappa = 0.90), indicating high levels of interrater reliability. Regarding the instance of rater disagreement, one rater believed the plot to be ambiguous while the other believed it to be dimensional, though the raters were able to come to an agreement after discussion.

TAXOMETRIC RESULTS

Figure 1 displays the averaged graphical results for each of the three taxometric procedures that were applied to the SIB data. As seen in the Figure, the averaged curves generated by the MAXEIG and MAMBAC procedures failed to evidence the discrete peaks that would be expected of a taxonic variable.¹ In addition, an examination of the individual data plots (MAXEIG $n = 5$, MAMBAC

¹Due to space limitations, only the graphical results and taxometric output of the MAXEIG analyses conducted using 300 windows are presented.

Table 4
Descriptive Data, Psychometric Properties, and Correlation Coefficients of the SIB Indicators

Indicator	Mean	SD	Range	Validity	Skew	Correlations (Full Sample)				
						1	2	3	4	5
# Methods	2.62	2.09	0 - 15	2.35	1.99	-				
Intent	0.04	0.23	0 - 2	1.67	5.83	.26	-			
Frequency	7.68	3.24	0 - 12	1.81	0.35	.41	.28	-		
Suicide History	1.05	1.30	0 - 7	1.31	0.95	.41	.08	-.21	-	
Severity	0.63	1.28	0 - 6	2.06	1.85	.34	.12	-.25	.31	-

n = 20) revealed that none of the plots exhibited a peak. Rather, the vast majority of the plots (22 out of 25) were consistent with shapes demonstrated by dimensional variables, similar to the simulated dimensional plots, and rated as dimensional by both raters, with the remaining 3 plots rated as ambiguous. The ICT supported the dimensional interpretation, with the clarity of the support for a dimensional solution increasing as the number of overlapping windows increased. The objective fit index scores also provided strong support for a dimensional interpretation (MAXEIG CCFI = .31, MAMBAC CCFI = .26). Similarly, the L-Mode data plot did not exhibit the bimodal distribution that would be anticipated for a categorical variable. Rather, the SIB plot exhibited a clear unimodal distribution, which was similar to the simulated dimensional plot and is consistent with dimensional latent structure. The L-Mode CCFI score also supported a dimensional solution (L-Mode CCFI = .38).

Discussion

The purpose of this study was to investigate whether SSI and NSSI are most accurately conceptualized as dimensional variants of SIB or distinct SIB categories using the taxometric method. Multiple taxometric procedures and consistency tests (e.g., multiple plot raters, ICT, CCFIs) were utilized to ensure a strong test of the latent structure of SIB. A visual inspection of the plots generated by the three taxometric procedures indicated that the vast majority of the research plots consistently resembled a dimensional construct, and the objective fit index scores strongly supported the visual interpretation. Thus, the

cumulative results of this study provide preliminary evidence that NSSI and SSI represent ranges on a single dimension of SIB rather than discrete typologies.

The dimensionality of NSSI/SSI is congruent with the findings of previous research indicating a positive linear relationship between NSSI and suicidal behaviors, as well as observations that individuals who self-injure often endorse multiple and vacillating motivations for their actions (Brunner et al., 2007; Nock et al., 2006; Whitlock & Knox, 2007; Whitlock et al., 2008). These findings suggest that the presence or absence of suicidal intent, though important to assess in clinical settings, does not represent naturally occurring categorical distinctions. Rather, these findings support the contention that NSSI should be considered on the same spectrum of self-injury as SSI (e.g., Kapur et al., 2013). One issue that will require further research regards how to most accurately conceptualize severity along the SIB spectrum. Although it may seem intuitive to assume SSI likely represents the extreme on the SIB continuum, it is important to consider other factors as well. For example, some individuals engage in SSI using means with very low lethality probability and little suicidal consideration, whereas others engage in relatively severe forms of SIB without any intention to die. Thus, determination of the severity of SIB should include consideration of all relevant factors (e.g., level of impulsivity, history of SIB, types of SIB used) and not assume that an individual engaged in SSI is exhibiting the most extreme form of SIB.

The reconceptualization of SIB as a spectrum ranging from NSSI to SSI has important implications for the assessment, diagnosis, and treatment of SIB. For example, measures that attempt to categorize individuals as exhibiting either NSSI or SSI are generally contraindicated. Although dichotomization of a continuous variable may be desirable or necessary due to methodological or practical reasons, dichotomization of a continuous variable can also result in decreased statistical power, spurious associations, inflated effect sizes, and a loss of potentially important information (Cohen, 1983). Rather, optimal SIB instruments will evaluate the full continuum

Table 5
Summary of Taxometric Output for MAXEIG, MAMBAC, and L-Mode Analyses of the SIB Data

	Nuisance Correlations (Taxon, Complement)	Base Rate (SD)	CCFI	Number Taxonic
MAXEIG	.04, .07	.11 (.02)	.31	0/5
MAMBAC	.01, .02	.23 (.24)	.26	0/20
L-Mode	.15, -.06	.67	.38	0/1

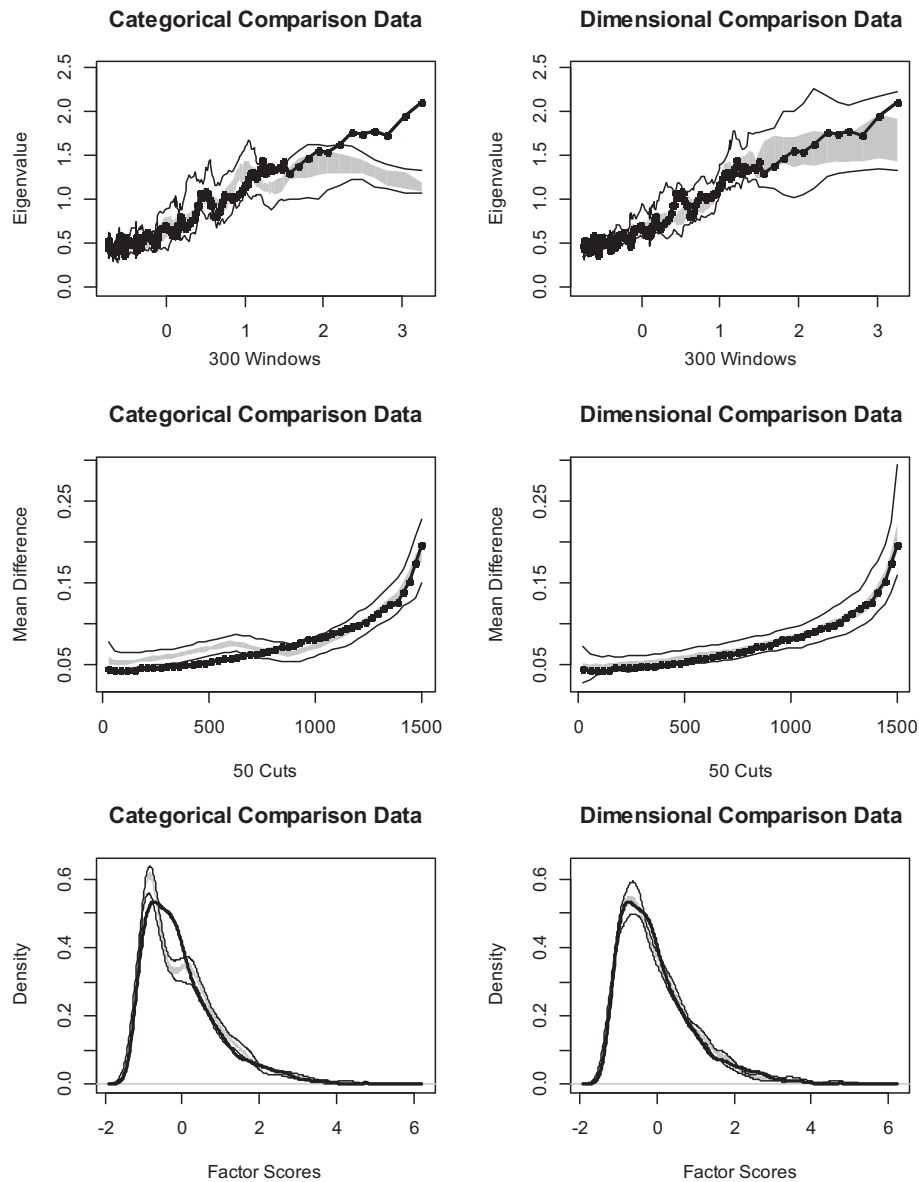


FIGURE 1 MAXEIG (top), MAMBAC (middle), and L-Mode (bottom) plots imposed on simulated taxonic and dimensional comparison plots.

of SIB, attempt to discriminate evenly across the spectrum, allow for the differences that exist between ends of the spectrum (e.g., methods, frequency, severity of SIB, etc.), and incorporate multiple predictors of potential suicidality.

The present findings also raise concern regarding the use of intent and severity of physical harm as exclusion criteria for the proposed NSSI Disorder (American Psychiatric Association, 2013). Specifically, the presence of suicidality, suicidal history, or severe physical injury may not indicate that an individual should not be considered a self-injurer, but rather that the self-injury is more extreme or severe. This specificity may be accomplished using severity specifiers (e.g., “mild,” “moderate,” or

“severe”) or numerical labels to represent a similar classification during the diagnostic process. A client’s endorsement of suicidality when self-injuring also should not be used to rule out a conceptualization of a primary problem of SIB, as a combination of suicidality and SIB may be on the more severe end of the SIB spectrum, especially considering findings that suicidality relates to higher severity of SIB (Csorba et al., 2009; Whitlock et al., 2008). Thus, when clinicians treat self-injurious clients, even clients who do not endorse suicidality, the spectrum of SIB must be taken into account, particularly those facets of SIB that may indicate greater severity of self-injury (Nock, 2010). Although monitoring suicidality is considered standard protocol when working with

self-injurious clients, the results of this study provide additional support for tracking severity of SIB. Clinicians working with a self-injurious client should be aware of patterns of SIB that maintain or accelerate the risk of suicidal behavior, such as number of methods used (Nock et al., 2006; Whitlock et al., 2008; Zlotnick et al., 1997) and frequency of the behavior (Brunner et al., 2007; Csorba et al., 2009), and implement behavioral procedures to shape the coping pattern in a safer direction.

The conceptualization of NSSI and SSI as variants along a single dimension also has implications for research methodology. Often, individuals who report suicidal intent for SIB are excluded from SIB studies (e.g., Whitlock et al., 2006), as current definitions of SIB often preclude those who injure with intent to suicide from being considered part of the self-injurious population. Excluding SSI from SIB research results in the loss of potentially important information regarding SIB, especially considering the preliminary evidence garnered from this study that those who engage in SSI may represent a more severe side of the SIB population as a whole. Thus, researchers would be more accurate to conceptualize participants who engage in SSI as a more extreme or severe version of SIB rather than a separate population altogether.

The present research is novel in that it represents the first published taxometric investigation of the latent structure of SIB, and the study design has several strengths that enhance confidence in the dimensional findings. For example, the present study was conducted using a large, diverse sample of individuals (>1,500) with a history of SIB. In addition, this investigation utilized a rigorous process of consistency testing that included the use of multiple taxometric procedures, two independent raters, and an objective fit index. Further, analyses were conducted using indicators that were derived from a national survey that assessed the full spectrum of SIB phenomena and have been suggested in previous research to distinguish SSI from NSSI (i.e., severity, frequency of SIB, suicide history, and number of methods used), and results were clear and consistent in their support for a dimensional solution.

However, the study also had several limitations that warrant acknowledgment. For example, the data utilized in the present study reflects participants' perceptions of prior SIB and their motivations during those events, which may be limited and/or influenced by biases, generalizations, and insight (Kapur et al., 2013). In addition, the present research was aimed at examining whether NSSI and SSI are categorically distinct or dimensionally distributed and is not able to address other potential discriminations often made

within the self-harm literature. For example, additional research is necessary to determine whether deliberate SIB (e.g., self-cutting) and indirect self-harm (e.g., substance abuse) represent separate classes of self-harm or should be considered as falling along a continuum of self-destructiveness (e.g., Nock, 2010). Further, although the sample was comprised of a large number of individuals with a history of SIB, relatively few respondents indicated that they engaged in SIB with the primary reason being intent to die. While these rates are consistent with the low rates of suicidal intent noted among other samples of individuals engaging in SIB (Patton et al., 1997), some research has suggested that taxometric procedures may be limited in their ability to discriminate a dimensional variable assessed using highly skewed indicators from a low base rate taxon (e.g., Beach, Amir, & Bau, 2005). However, concerns regarding the nondetection of a low base rate taxon are relatively low for several reasons. Specifically, the indicators utilized in the present research generally exhibited acceptable levels of skew (i.e., < 2.0 with the exception of the intent indicator; Beauchaine, 2007), and when analyses were rerun after removing the intent indicator, results remained interpretable and fully consistent with a latent dimension.² Further, the primary concern with discriminating a low base rate taxon from a dimensional variable assessed using highly skewed indicators is that both tend to generate MAXEIG and MAMBAC plots with cusps toward one side, though the vast majority of data plots in the present study did not exhibit cusps toward one side, and those that did were rated as ambiguous rather than supporting a dimension.

The present research is also limited with regard to several sample characteristics, including the use of an exclusively female college student population. Thus, it is unclear the extent to which these findings generalize to males and the broader population, as well as to clinical populations. Additionally, while participants endorsed a variety of disorders (e.g., depression, anxiety), separate analyses were not conducted within these clinical populations. Thus, it is unclear whether the dimensional structure observed in the present study is generalizable across specific disorders associated with SIB, such as borderline personality disorder, major depression, and PTSD. Finally, it is important to note that the analyses conducted in the present research were run exclusively with a sample that engaged in SIB. Thus, whether the latent structure of SIB is continuous in the general population (i.e., across SIB and non-SIB

²Details regarding the analyses conducted without the intent indicator, including data plots, were not included due to page limitations but are available from the authors upon request.

individuals) remains an empirical question that has yet to be addressed.

The results of the present study also have important implications for future SIB research. Although research suggests that taxometric procedures are highly effective in distinguishing between dimensional and categorical latent structure, research into latent structure is optimally a two-part process (e.g., McGrath & Walters, 2012). The first stage of latent structure research is aimed at determining the type of latent structure (e.g., categorical versus continuous) of a given construct. Once type of latent structure is known, researchers are then able to select the structural modeling techniques that are most appropriate to construct. From this sequential perspective, the present study represents an important first step in the examination of the latent structure of SIB, and the dimensional findings should be used to inform subsequent research into estimating the number of potential SIB dimensions and relevant parameters using appropriate methods. It will also be important for future research to replicate and extend the present findings regarding the type of latent structure exhibited by SIB using more diverse clinical samples, other prospective SIB indicators, samples with higher rates of suicidal intent, and alternate statistical methodology, such as factor mixture modeling, which can also evaluate potential hybrid (e.g., dimensional-taxonic) models of latent structure. Such replications would enhance confidence in the conclusion that the NSSI and SSI are not categorically distinct types of SIB. Finally, given that NSSI and SSI are dimensionally related, additional research is needed to determine the optimal indicators of SIB severity and potential lethality to help inform clinical decision-making, such as when intervention and/or psychiatric hospitalization are most warranted.

Conflict of Interest Statement

The authors declare that there are no conflicts of interest.

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