



Empirically Derived Subgroups of Self-Injurious Thoughts and Behavior: Application of Latent Class Analysis

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Latent class analysis was applied to the sample data to identify homogeneous subtypes or classes of self-injurious thoughts and behavior (SITB) based on indicators indexing suicide ideation, suicide gesture, suicide attempt, thoughts of nonsuicidal self-injury (NSSI), and NSSI behavior. Analyses were based on a sample of 1,809 healthy adults. Associations between the emergent latent classes and demographic, psychological, and clinical characteristics were assessed. Two clinically relevant subtypes were identified, in addition to a class who reported few SITBs, and were labeled as follows: low SITBs (25.8%), NSSI and ideation (25%), and suicidal behavior (29.2%). Several unique differences between the latent classes and external measures emerged. For instance, those belonging to the NSSI and ideation class compared with the suicidal behavior class reported lower levels of entrapment, burdensomeness, fearlessness about death, exposure to the attempted suicide or self-injury of family members and close friends, and higher levels of goal disengagement and acute agitation. SITBs are best explained by three homogenous subgroups that display quantitative and qualitative differences. Profiling the behavioral and cognitive components of suicidal and nonsuicidal self-injury is potentially useful as a first step in developing tailored intervention and treatment programs.

Self-injury remains a significant behavioral health concern for adolescents and young adults. One impediment to progress with respect to the understanding and treatment of self-injury has been the lack of consistency in how these behaviors are conceptualized, defined, and classified (Nock, 2010). Central to this lack of clarity is debate regarding whether self-injurious behavior (SIB) is most accurately conceptualized as a dimensional or categorical construct, and whether self-injury with suicidal intent (sui-

cide attempts) differs in etiology and prognosis from behaviors performed with an absence of suicidal intent (i.e., nonsuicidal self-injury [NSSI]; Mars et al., 2014). Thus, accurately delineating the relationship between NSSI and suicidal behavior (ideation, plans, gestures, and attempts)—both their distinctiveness and overlap—is essential for research and intervention efforts (Klonsky, May, & Glenn, 2013).

Several important differences have been found between suicide attempts and

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NSSI, including differences in prevalence, frequency, lethality of methods, and attitudes toward life and death (e.g., Klonsky & Muehlenkamp, 2007; Mars et al., 2014; Muehlenkamp & Kerr, 2010). Moreover, studies have shown that suicidal SIBs are associated with greater levels of psychological and psychosocial impairment compared with NSSI alone (e.g., Claes et al., 2010; Jacobson, Muehlenkamp, Miller, & Turner, 2008). Consequently, some researchers argue that a clear distinction can be made between acts of self-injury that occur with intent to die and those that occur with no intent to die (e.g., Muehlenkamp & Kerr, 2010; Nock, 2010). However, despite being conceptually and characteristically distinct from each other, many individuals engage in both behaviors (Andover, Morris, Wren, & Bruzese, 2012; Bryan, Bryan, May, & Klonsky, 2015; Jacobson et al., 2008; Klonsky et al., 2013). There are also a number of similarities in the risk factors and correlates of suicide attempts and NSSI (Andover et al., 2012; Mars et al., 2014). Furthermore, in prospective studies, NSSI has been found to predict future suicide ideation and attempts beyond the effects of other risk factors (e.g., Asarnow et al., 2011; Bryan & Bryan, 2014; Guan, Fox, & Prinstein, 2012). For these reasons, some researchers have regarded all forms of self-injurious behavior as falling along a continuum regardless of intent (e.g., Kapur, Cooper, O'Connor, & Hawton, 2013; Stanley, Winchel, Molcho, Simeon, & Stanley, 1992).

As Nock, Borges, Bromet, Alonso, et al. (2008) noted, further research is warranted on how to best classify self-injurious thoughts and behavior (SITB). Statistical modeling in the form of latent class analysis (LCA) offers a particularly promising avenue for pursuing this agenda. LCA is a person-centered approach which assumes that heterogeneous individuals from a population can be "typed" or grouped into smaller relatively homogenous subgroups with similar patterns of behaviors or trait endorsements. Subtyping has potential implications for guiding research on etiology, enhancing

clinical management by improving diagnostic practices and prevention approaches, and developing tailored or differential treatment strategies. The identification of meaningful typologies is particularly appealing in this context given the public health significance and economic burden of SITB (Knapp, McDaid, & Parsonage, 2011). LCA has been widely used in psychiatric nosology to empirically derive subtypes of disorders including posttraumatic stress disorder (e.g., Elklit, Hyland, & Shevlin, 2014), psychopathy (e.g., Dhingra, Boduszek, & Kola-Palmer, 2015), and pathological gambling (e.g., McBride, Adamson, & Shevlin, 2010). Applications of this technique to SITBs are only beginning to emerge (Bracken-Minor, McDevitt-Murphy, & Parra, 2012; Dhingra, Boduszek, Palmer, & Shevlin, 2014; Hamza & Willoughby, 2013; Klonsky & Olin, 2008; Somer et al., 2015; Whitlock, Muehlenkamp, & Eckenrode, 2008).

Klonsky and Olin (2008) identified four classes of self-injurers based on the severity of NSSI method, descriptive features, and functions of self-injury: experimental NSSI, mild NSSI, multiple functions/anxious NSSI, and automatic functions/suicidal NSSI. The most severe symptoms and behaviors were seen in the fourth latent class. Similar findings have been reported in subsequent studies (Bracken-Minor et al., 2012; Somer et al., 2015). Whitlock et al. (2008) defined three subgroups in terms of frequency, forms, and severity of NSSI behavior. Hamza and Willoughby (2013) used characteristics of NSSI (e.g., lifetime frequency, most recent engagement) and suicidal behavior (e.g., lifetime suicide ideation and suicide attempts) as class indicators to define three subgroups. The classes were labeled "an infrequent NSSI/not high risk for suicidal behavior group," "a frequent NSSI/not high risk for suicidal behavior group," and "a frequent NSSI/high risk for suicidal behavior group." Dhingra et al. (2014) identified two classes of self-injurers (high and low self-injury risk classes) based on data from the MacArthur Violence Risk Assessment Project and the following items:

thoughts of hurting the self, attempt to hurt the self, self-injured alone, acts to gain help during or after self-injury, final acts in anticipation of death, and writing a self-injury note.

These findings provide support for the heterogeneity of SITBs. However, subgroups were derived largely on the basis of NSSI characteristics rather than a range of different SITBs. Thus, these studies did not examine the potential co-occurrence of NSSI, suicidal thoughts, and suicide gestures. Assessing relations among these different SITBs is important because it can help clinicians and researchers to better understand how these different constructs are related. Such work may also help to prevent unnecessary and potentially iatrogenic hospitalizations, inaccurate case conceptualization and treatment planning, misallocation of resources, or overlooking valuable indicator (s) of suicide risk (Klonsky et al., 2013).

THE CURRENT RESEARCH

As most prior research on SITBs has focused on one-dimensional outcomes (e.g., NSSI behavior versus suicide attempt or suicide ideation versus suicide attempt), thus neglecting more complex patterns, this study aims to examine whether distinct, homogenous subtypes of SITBs can be defined. A second aim is to validate the emergent typology by reference to key risk factors cited in the extant literature (O'Connor & Nock, 2014). As this is the first study to examine latent classes of a full range of SITBs, we did not have specific hypotheses about the number of subgroups that would be derived from the data or predictors of class membership.

METHOD

Sample

Participants were 1,809 (476 male and 1,333 female) university students recruited

from various faculties from three UK universities. Participants were aged between 18 and 66 years ($M_{\text{age}} = 24.05$; $SD = 8.09$). Most students identified themselves as White (80.9%), were currently in a relationship (52.6%), and described their sexual orientation as heterosexual/straight (84.4%).

Measures

Defeat. Feelings of defeat were assessed using the Defeat Scale (Gilbert & Allan, 1998). This is a 16-item self-report measure of perceived failed struggle and loss of rank (e.g., "I feel defeated by life"). Respondents indicate on a 5-point Likert-type scale the extent to which each item describes their feelings (0 = *not at all* to 4 = *extremely*) over the past 7 days. This scale has been found to have good psychometric properties (Gilbert & Allan, 1998; Gilbert, Allan, Brough, Melley, & Miles, 2002).

Entrapment. Entrapment represents a sense of being unable to escape feelings of defeat and rejection and is measured by the Entrapment Scale (Gilbert & Allan, 1998). This 16-item self-report measure assesses motivation to escape (e.g., "I am in a situation I feel trapped in"). Items are rated on a 5-point scale; higher scores indicate more feelings of entrapment. The Entrapment Scale has good psychometric properties (Gilbert & Allan, 1998; Gilbert et al., 2002).

Brooding Rumination. Brooding, defined as the extent to which individuals passively focus on the reasons for their distress (e.g., "Think, 'Why can't I handle things better?'"), was measured using five items from the Response Styles Questionnaire (RSQ; Nolen-Hoeksema, 1991). Treynor, Gonzalez, and Nolen-Hoeksema (2003) have reported the internal reliability and discriminant validity of this brooding ruminative response-style scale.

Perceived Burdensomeness and Thwarted Belongingness. Perceived burdensomeness and thwarted belongingness were measured with the 12-item version of the Interpersonal Needs Questionnaire (INQ; Van

Orden, Witte, Gordon, Bender, & Joiner, 2008). The INQ assesses respondent's current beliefs about feeling connected to others (i.e., thwarted belongingness; e.g., "I feel disconnected from other people") and feeling like a burden on the people in their lives (i.e., perceived burdensomeness; e.g., "The people in my life would be better off if I were gone"). Seven items measure belongingness, and five items measure burdensomeness. Items are rated on a Likert-type scale ranging from 1 (*not at all true for me*) to 7 (*very true for me*), with higher scores reflecting higher levels of thwarted belongingness and burdensomeness. The two subscales correlate in the expected directions with measures of mood, psychological symptoms, and social connectedness and incrementally predict past and current suicidal ideation and behaviors above and beyond other risk factors for suicide (Bryan, Morrow, Anestis, & Joiner, 2010; Van Orden et al., 2008).

Goal Reengagement and Disengagement. The goal adjustment scale (GAS; Wrosch, Scheier, Miller, Schulz, & Carver, 2003) is a 10-item instrument that consists of two subscales: (1) goal disengagement (four items) and (2) goal reengagement (six items). Goal disengagement measures one's perceived difficulty in reducing effort and relinquishing commitment toward unobtainable goals (e.g., "It's easy for me to reduce my effort toward the goal" [reverse scored]). The goal reengagement subscale taps one's perceived ability to reengage in other new goals if they face constraints on goal pursuits (e.g., "I think about other new goals to pursue"). Items are scored on 5-point Likert-type scales ranging from 1 (*not at all*) to 5 (*certainly*).

Hopelessness. Hopelessness was measured using the 20-item Beck Hopelessness Scale (BHS; Beck, Weissman, Lester, & Trexler, 1974). Respondents are asked to indicate either agreement or disagreement with statements that assess pessimism for the future. This is a reliable and valid measure that has been shown to predict eventual suicide (e.g., Beck & Steer, 1989).

Confirmatory factor analysis (Boduszek & Dhingra, in-press) supported Beck et al.'s (1974) three-factor solution: Factor 1 (Feelings about the future), Factor 2 (Loss of Motivation), and Factor 3 (Future Expectations).

Discomfort Intolerance. The Discomfort Intolerance Scale (DIS; Schmidt, Richey, Cromer, & Buckner, 2007) is a five-item self-report index of the degree to which individuals tolerate physical discomfort, including pain (e.g., "I can tolerate a great deal of physical discomfort" [reverse scored]). Participants rate the questions on a scale ranging from 0 (*not at all like me*) to 6 (*extremely like me*). The scale has demonstrated adequate psychometric properties in other research (e.g., Ribeiro et al., 2014).

Fearlessness About Death. The Acquired Capability for Suicide Scale (ACSS; Van Orden et al., 2008) was originally developed as a 20-item self-report measure to assess both fearlessness about death (FAD) and pain insensitivity. However, a recent psychometric investigation of the ACSS supports the use of a seven-item subscale of the ACSS to assess FAD (ACSS-FAD; e.g., "I am very much afraid to die"; Ribeiro et al., 2014). In this study, the ACSS-FAD subscale was utilized as a measure of FAD. Items were rated on a 5-point scale, with higher scores indicating greater FAD. The scale showed good reliability, discriminant, and convergent validity (Van Orden et al., 2008).

Exposure to Suicidal Behavior. Respondents were asked the following two questions about self-harm by close friends and family: "Has anyone among your close friends [your family] attempted suicide or deliberately harmed themselves?" Items were drawn from research by O'Connor, Rasmussen, and Hawton (2012).

Acute Agitation. The Brief Agitation Measure (BAM; Ribeiro, Bender, Selby, Hames, & Joiner, 2011) is a brief three-item self-report measure designed to index subjective agitation levels. Items are rated on a 7-point Likert Scale from 0 (*not at all true for me*) to 6 (*very much true for me*). Higher total scores indicate greater severity of agitation.

The measure has demonstrated solid psychometrics with respect to reliability and validity in both young adults and clinical outpatients (Ribeiro et al., 2011).

Anxiety and Depression. The Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983) was employed to measure anxiety (e.g., “I feel tense or ‘wound up’”) and depression (e.g., “I feel as if I am slowed down”). It consists of 14 questions, seven each to measure depression and anxiety. The HADS is a reliable and valid measure of affect (Bjelland, Dahl, Haug, & Neckelmann, 2002).

Self-Injurious Thoughts and Behavior. Participants’ history of SITBs was assessed using items drawn from the self-report version of the Self-Injurious Thoughts and Behaviors Interview (SITBI; Nock, Holmberg, Photos, & Michel, 2007). These items asked participants to indicate the presence of the following: (a) suicide ideation (“Have you ever had thoughts of killing yourself?”), (b) suicide plan (“Have you ever actually made a plan to kill yourself?”), (c) suicide gesture (“Have you ever done something to lead others to believe you wanted to kill yourself when you really had no intention of doing so?”), (d) suicide attempt (“Have you ever made an actual attempt to kill yourself in which you had at least some intent to die?”), (e) NSSI thoughts (“Have you ever had thoughts of purposely hurting yourself without wanting to die? (e.g., cutting or burning)”) and (f) NSSI behavior (“Have you ever done something to purposely hurt yourself without intending to die?”).

Procedure

The research protocol was reviewed and approved by the institutional ethics panels of all three participating universities. Participants were recruited via an e-mail invite to participate in a study of suicide. Within this e-mail it was made clear to potential participants that they did not need to have experienced suicidal thoughts and behaviors to take part. The study was also advertised on two of the participating uni-

versity’s websites. Participants completed the study online using Qualtrics, a Web interface that allows for secure remote data collection through the distribution of anonymous secure links to the protocol. Participants were required to consent before the survey was presented online. Participation in the current study was voluntary, and no inducements or obligations were used. All participants were debriefed and given phone numbers for local mental health services.

Analysis

Data were analyzed using Mplus version 6 (Muthen & Muthen, 2008-12). LCA is a statistical method used to identify homogeneous groups (or classes) from categorical multivariate data. Frequently described as a categorical variant of factor analysis, LCA assumes that associations among a set of observed categorical variables can be explained by a finite number of mutually exclusive classes. LCA is particularly well suited to the aims of this study as follows: (1) it is exploratory in nature and data-driven, meaning that a priori assumptions are not made concerning the number of latent classes present; and (2) it does not assume independence among indicators.

Currently, there is no consensus regarding a single statistical index that identifies the most appropriate number of classes within a given population (Nylund, Asparouhov, & Muthén, 2007). Consequently, through an iterative process, models with a successive number of classes are specified. Extraction of latent classes ceases when there is little empirical or substantive support for the inclusion of a further class. Model fit is evaluated on the basis of goodness-of-fit statistical and parsimony considerations. Statistical indices reported here include the following: Akaike information criterion (AIC; Akaike, 1974); Bayesian information criterion (BIC; Schwarz, 1978); sample size-adjusted BIC (SSABIC; Sclove, 1987); Lo–Mendell–Rubin likelihood ratio test (LMR-LRT; Lo, Mendell, & Rubin,

2001); and entropy (Ramaswamy, DeSarbo, Reibstein, & Robinson, 1993).

Akaike information criterion, BIC, and SSABIC are goodness-of-fit indices commonly used for comparison across competing models: lower values reflect better-fitting models and, accordingly, extraction of latent classes should cease when these indices reach their lowest values. Recent simulation studies indicate that BIC is one of the most reliable indicators of the correct number of latent classes (Nylund et al., 2007). Another useful tool for class enumeration is the LMR-LRT, which assesses the improvement in fit between competing models: a nonsignificant value ($p > .05$) suggests that the model with one fewer class provides a more parsimonious fit to the data. Based on the posterior class membership probabilities, entropy evaluates how well each of the classes is separated and represented by the data; values range from 0 to 1, with high values preferred. Finally, selection of the best-fitting model was based on whether the model reflected coherent, distinct, and conceptually meaningful subgroups and adequately accounted for the heterogeneity in the sample.

Following identification of the best-fitting latent class solution, covariates (defeat, entrapment, hopelessness, fearlessness about death, brooding rumination, goal reengagement and disengagement, anxiety, depression, acute agitation, discomfort intolerance, perceived burdensomeness, thwarted belongingness, exposure to self-injurious behaviors of friends and family members, and gender) were included in the model to help describe the heterogeneity in self-injurious thoughts and behavior and to substantiate the validity of the emergent classes or subtypes. According to Muthén (2003), "The estimated prediction of class membership is a key feature in examining predictions of theory. If classes are not statistically different with respect to covariates that, according to theory, should distinguish classes, crucial support for the model is absent" (p. 373). Odds ratios (ORs) and accompanying confidence intervals (CIs) were calculated to

evaluate these associations. Odds ratios reflect the proportionate change in odds of membership of a given class, relative to the reference class, associated with a one-unit change in the covariate. When comparing class 1 with class 2, coefficients from the logistic regression were transformed to ORs by exponentiation for ease of interpretation. Similar transformations were made of the coefficients ± 1.96 standard errors to generate 95% CIs of the ORs. Cohen's d statistic (Cohen, 1988) is reported in instances where significant differences between the classes emerged.

RESULTS

Descriptive Statistics and Correlations

Descriptive statistics, including means (M) and standard deviations (SD), for all measures are presented in Table 1, along with Cronbach's alphas.

Prevalence of the SITB Indicators

The proportion of participants endorsing each of the six SITB items is presented in Table 2. The majority of participants reported a lifetime history of suicide ideation (63.1%) and NSSI thoughts (52.4%). The remaining indicators were endorsed by between 15.7% and 39.7% of participants.

Estimation of the Number of Latent Classes

Three latent class models were fitted to the data, beginning with the most parsimonious two-class model through to a four-class model. The goodness-of-fit indices, provided in Table 3, suggest that the best-fitting model was a three-class solution. The AIC, BIC, and SSABIC were markedly lower for the three-class model compared to the two-class model. The nonsignificant LRT further confirmed that the four-class model was not a significant improvement over the

TABLE 1
Descriptive Statistics for All Continuous Variables

Variable	<i>M</i>	<i>SD</i>	Min	Max	Cronbach's α
Defeat	35.87	12.23	15	75	.95
Entrapment	34.49	34.49	16	78	.96
Hopelessness 1	2.74	2.74	0	7	.88
Hopelessness 2	1.65	1.81	0	7	.80
Hopelessness 3	2.42	1.87	0	7	.73
Fearlessness about death	21.90	7.07	7	35	.83
Brooding rumination	12.64	3.64	5	20	.78
Goal disengagement	10.76	3.44	4	20	.82
Goal reengagement	20.58	4.96	6	30	.91
Anxiety	16.72	4.49	7	28	.83
Depression	12.26	4.09	7	26	.83
Discomfort intolerance	16.85	4.64	5	30	.73
Acute agitation	9.69	5.89	3	21	.90
Burdensomeness	17.26	10.34	7	49	.93
Belongingness	22.74	7.81	5	35	.86

Hopelessness 1 = feelings about the future, Hopelessness 2 = loss of motivation, Hopelessness 3 = future expectations. *M*, means; *SD*, standard deviation; Min, minimum; Max, maximum.

TABLE 2
Endorsement Rates of SITB Items

Item	Frequency	%
Suicide ideation	813	63.1
Suicide plan	354	27.5
Suicide gesture	202	15.7
Suicide attempt	230	17.9
NSSI thoughts	675	52.4
NSSI behavior	510	39.7

SITB, self-injurious thoughts and behaviors; NSSI, nonsuicidal self injury.

three-class model. The entropy measure (.88) similarly suggests that the data were well defined by a three-class solution.

Latent Profiles

A comparison of profile plots suggested the three-class solution was more conceptually meaningful. Individuals were assigned to each of the three latent classes on the basis of their response profile and the estimated probabilities of endorsing the six items indexing self-injurious thoughts and behavior. To facilitate interpretation, Figure 1 depicts the endorsement probabilities associated with the three-class model; these are useful for adding substantive meaning to the latent classes (Nylund et al., 2007). As these profiles indicate, the three latent classes are primarily characterized by qualitative differences, suggesting

TABLE 3
Fit indices for the Latent Class Analysis of Self-Injurious Thoughts and Behavior

Model	AIC	BIC	SSABIC	LRT	<i>p</i>	Entropy
2 classes	5654.35	5808.50	5710.04	1873.17	<.001	.87
3 classes	5366.97	5645.44	5467.57	335.45	<.001	.88
4 classes	5337.10	5739.88	5482.61	79.42	.24	.85

AIC, akaike information criterion; BIC, Bayesian information criterion; SSABIC, sample size-adjusted BIC; LRT, Lo–Mendell–Rubin's adjusted likelihood ratio test.

they do not simply reflect a spectrum of severity.

Latent class 1 (29.9% of participants) comprised individuals who highly endorsed five of the six items, with item response probabilities ranging from .62 for suicide attempts to .86 for both suicide plan and NSSI thoughts. Item response probabilities are the probability of a particular observed response on a particular variable conditional on latent class membership. Item three (suicide gesture) was endorsed by few participants in this class (probability of .27). Consequently, this class is best characterized as a “suicidal behavior” class. Members of class 2 (25% of participants) had high item response probabilities of endorsing suicide ideation (.75), NSSI thoughts (.99), and NSSI behavior (.71) and a low probability of endorsing a suicide plan (.03), gesture (.19), or suicide attempt (.01). This class was thus considered the “NSSI and ideation” group. Class 3 (45.8% of participants) was characterized by participants who reported relatively low endorsement of all SITB items (conditional probabilities are all below .06, apart from suicide ideation item response probability of .34) and, as such, this class was considered as a “low SITB” class.

Validity of the Latent Classes

To validate the measurement model and to help describe the heterogeneity in SITBs, associations between the emergent latent classes and defeat, entrapment, hopelessness (three factors), fearlessness about death, brooding rumination, goal reengagement and disengagement, anxiety, depression, acute agitation, discomfort intolerance, perceived burdensomeness, thwarted belongingness, exposure (two items), and gender were examined using multinomial logistic regression.

The first column in Table 4 has the outcome of class 1 membership (suicidal behavior) compared to the reference category (class 3; low SITB). Results indicate that those participants who reported lower levels of belongingness (OR = .93) and higher levels of entrapment (OR = 1.05), fearlessness about death (OR = 1.06), perceived burdensomeness (OR = 1.06), and exposure to suicide or NSSI in a close friend (OR = 5.30) or family member (OR = 2.52) were significantly more likely to belong to this class while controlling for all covariates. Females were more likely to belong to this class (OR = 2.42). The second column in Table 3 has the outcome of the NSSI and

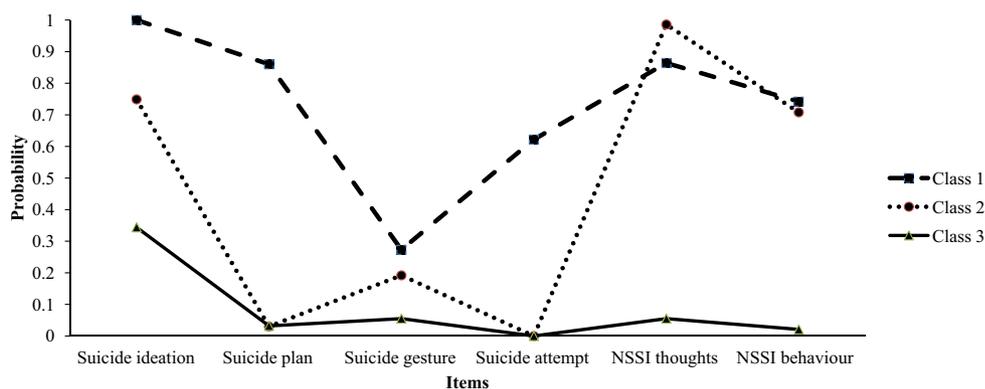


Figure 1. Latent profile plot of self-injurious thoughts and behavior (SITB). *Note:* Class 3 = low SITB (45.8% of participants); Class 2 = NSSI and ideation (25% of participants); Class 1 = suicidal behavior (29.2% of participants).

ideation class (class 2) compared to low SITB (reference category, class 3). The results suggest that higher goal disengagement (OR = 1.08), anxiety (OR = 1.10), and exposure 1 (friend; OR = 3.09) significantly increase the probability of membership in class 2. Additionally, females were more likely to belong to this class (OR = 2.13). The last column in Table 3 has the outcome of the NSSI and ideation (class 2) compared to suicidal behavior (class 1). The results suggest that lower entrapment (OR = .97), perceived burdensomeness (OR = .97), fearlessness about death (OR = .95), exposure to suicide or NSSI in a close friend (OR = .58) or family member (OR = .50), and greater goal disengagement (OR = 1.08) and acute agitation significantly increase the probability of membership in class 2 while controlling for all covariates.

DISCUSSION

In this study we aimed to empirically derive and validate a typology of SITBs based on endorsement of six items indexing a range of self-injurious thoughts and behaviors (i.e., suicide ideation, suicide plan, suicide gesture, suicide attempt, NSSI thoughts, and NSSI behavior). The LCA identified two clinically relevant homogeneous subgroups of SITBs, as well as a third subgroup of respondents that reported few SITBs. The suicidal behavior subgroup comprised respondents who exhibited high endorsement rates across all items, apart from suicide gestures. The second subgroup (NSSI and ideation) was characterized by high endorsement of suicide ideation, NSSI thoughts, and NSSI behavior. Finally, respondents belonging to the low SITBs, the largest subgroup, reported low endorsement of all SITBs.

The parallel profiles of the three latent classes, and the fact that the ORs did not always decline from class 1 to class 3 in the regression analysis, indicate that the groups are not distinguished primarily by the extent of item endorsement. In other words, the

latent classes are not differentiated by their location along a continuum of severity linking a broad range of thoughts and behavior, but instead by unique profiles. This result complements recent findings of important differences in the predictors of a range of suicidal and nonsuicidal behavior (e.g., Dhingra, Boduszek, & O'Connor, 2015; Klonsky & Muehlenkamp, 2007; Mars et al., 2014; Muehlenkamp & Kerr, 2010; Nock, Borges, Bromet, Cha, Kessler, & Lee, 2008) and argues against incorporating a dimensional conceptualization. Importantly, however, the results do not preclude the possibility that for some individuals, NSSI and suicidal behavior exist concurrently, and potentially on the same dimension.

The differential relationships between class membership and various external measures provide support for the validity of these classes. Specifically, individuals belonging to the suicidal behavior class were significantly more likely to report higher levels of entrapment, perceived burdensomeness, fearlessness about death, and exposure to the attempted suicide or self-injury of family members and close friends and lower levels of belongingness, than individuals belonging to the low SITBs class. Those belonging to the NSSI and ideation class were significantly more likely to report higher levels of anxiety, goal disengagement, and exposure to the attempted suicide or self-injury of a close friend as well as lower levels of perceived belongingness than the low SITBs class. These findings are consistent with prior research (e.g., Asarnow et al., 2011; Claes et al., 2010) which suggests that adults who report both NSSI and suicidal behavior may be a more severe group and are at greater risk for psychopathology and psychosocial impairment than individuals who engage in NSSI only. Finally, those belonging to the NSSI and ideation class compared with the suicidal behavior class reported lower levels of entrapment, burdensomeness, fearlessness about death, exposure to the attempted suicide or self-injury of family members and close friends, and higher levels of goal disengagement and acute agitation. The

TABLE 4
Associations Between SITB Classes and Covariates

Variable	Class 1 with 3 OR (95% CI)	Cohen's <i>d</i>	Class 2 with 3 OR (95% CI)	Cohen's <i>d</i>	Class 2 with 1 OR (95% CI)	Cohen's <i>d</i>
Gender	2.42** (1.32/4.43)	.49	2.13** (1.28/3.54)	.42	.86 (.46/1.62)	—
Defeat	1.03 (.97/1.07)	—	1.00 (.97/1.03)	—	.98 (.94/1.01)	—
Entrapment	1.05*** (1.02/1.08)	.03	1.01 (.99/1.04)	—	.97** (.94/.99)	.02
Brooding rumination	1.03 (.95/1.11)	—	1.06 (.98/1.13)	—	1.02 (.95/1.11)	—
Burdensomeness	1.06*** (1.03/1.10)	.03	1.03 (.99/1.07)	—	.97* (.94/1.00)	.02
Belongingness	.93*** (.90/.97)	.04	.95** (.92/.99)	.03	1.02 (.99/1.06)	—
Goal disengagement	1.00 (.94/1.07)	—	1.08* (1.01/1.15)	.04	1.08* (1.01/1.15)	.04
Goal reengagement	.99 (.95/1.05)	—	.99 (.96/1.04)	—	1.01 (.96/1.05)	—
Hopelessness 1	1.11 (.95/1.30)	—	1.08 (.93/1.26)	—	1.01 (.85/1.21)	—
Hopelessness 2	.93 (.79/1.11)	—	.86 (.73/1.02)	—	.91 (.79/1.06)	—
Hopelessness 3	.86 (.72/1.04)	—	1.02 (.87/1.19)	—	1.18 (.96/1.45)	—
Distress tolerance	1.01 (.96/1.06)	—	1.03 (.98/1.07)	—	1.01 (.97/1.06)	—
Fearlessness about death	1.06*** (1.03/1.10)	.03	1.01 (.98/1.04)	—	.95*** (.92/.98)	.03
Exposure (friend)	5.30*** (3.18/8.83)	.92	3.09*** (2.03/4.71)	.62	.58* (.34/.98)	.30
Exposure (family member)	2.32*** (1.48/3.62)	.46	1.19 (.76/1.85)	—	.50*** (.33/.75)	.38
Acute agitation	.98 (.93/1.04)	—	1.03 (.98/1.08)	—	1.06* (1.00/1.12)	.03
Anxiety	1.05 (.98/1.12)	—	1.10** (1.03/1.17)	—	1.05 (.98/1.12)	—
Depression	.98 (.91/1.05)	—	.96 (.89/1.03)	—	.98 (.91/1.06)	—

Class 1 = suicidal behavior class, Class 2 = NSSI and ideation, Class 3 = low SIT, Gender—female is reference category, Hopelessness 1 = feelings about the future, Hopelessness 2 = loss of motivation, Hopelessness 3 = future expectations. OR, odds ratio; 95% CI, confidence interval.
p* < .05; *p* < .01; ****p* < .001.

magnitude of the differences between these two classes was very small, however, except for the two and exposure variables. This suggests that these two groups are largely the same on traditional suicide risk factors (e.g., anxiety, depression, and hopelessness) and supports the growing literature that suggests that the factors associated with suicide ideation formation are distinct from those factors concerned with behavioral enactment (e.g., Klonsky & May, 2014; O'Connor, 2011; O'Connor & Nock, 2014).

Clinically, our results suggest that individuals belonging to class 2 (NSSI and ideation) would benefit from interventions that highlight the importance of relinquishing commitment to particular goals in the face of adversity (i.e., goal disengagement). This may be particularly true for those individuals who struggle with re-engaging with new goals (O'Connor, O'Carroll, Ryan, & Smyth, 2012), although the interaction between goal disengagement and re-engagement was not tested in this study. Individuals belonging to this class would also likely benefit from emotional regulation training. For participants belonging to class 1 (suicidal behavior), our results suggest that more intensive intervention is needed. In particular, cognitive and behavioral strategies designed to reduce the desire for suicide (Joiner, Van Orden, Witte, & Rudd, 2009; O'Connor, 2011) despite increased acquired capability (e.g., fearlessness about death) and exposure to the attempted suicide or self-injury of family members and close friends warrant further consideration.

Strengths of this study include the large sample, use of well-established and valid measures, and the application of LCA to document the presence and characteristics of homogeneous subgroups of SITBs. Nevertheless, certain limitations should be considered when interpreting the findings. First, since all information was collected via self-report, reporting biases including recall error and underreporting cannot be ruled out. Nonetheless, as objective measures of SITBs do not exist, most assessments tend to rely to some extent on self-report data. Sec-

ond, an inherent limitation associated with LCA is that it precludes analysis of within-class heterogeneity, including individual differences in recency, frequency, and severity of cognitions and/or behavior. Notwithstanding this, LCA is less restrictive than other clustering techniques in that it does not assume homogeneity of variance, linear relationships, or underlying normal distributions (e.g., cluster analysis). Furthermore, it has the advantages of assigning respondents to groups based on probabilities estimates from the model and yielding statistical fit indices to evaluate competing models (e.g., Hagenars & Halman, 1989). Third, there is an absence of additional sources of information concerning the identified subtypes (e.g., based on follow-up studies or linkage analysis), which are needed to validate these findings. Fourth, the typology that emerged in the analysis was based on a student sample; thus, the results may not extrapolate to clinical or forensic samples or to cultures where views regarding suicide are different. Basing a typology on data from treated populations (samples derived from psychiatric hospitals, outpatient clinics, and primary care practices) may, however, introduce selection bias as individuals in clinical settings do not represent a random sample of those affected in the population and are likely to display greater symptom severity. It follows that such typologies may not generalize to the wider population, thereby limiting their utility in terms of public health initiatives. Finally, there were variations in the assessment periods between the different measures (i.e., over the previous 7 days, lifetime, and so on); thus, there is greater potential for recall bias for constructs considered over a lifetime, and a possibility that different findings would emerge in studies that assess current or more recent SITBs.

Notwithstanding these limitations, the present study highlights the utility of LCA in elucidating the heterogeneity in SITBs and provides empirical support against a dimensional conceptualization of self-injury. The results suggest that rather than adopting a generic one-size-fits-all

approach, profiling patterns of SITBs may be a potentially useful first step in informing tailored intervention and treatment strategies. Given that SITBs are transitory in nature (e.g., Nock, Prinstein, & Sterba, 2009), future research efforts should be directed toward prospectively examining

typologies of self-injurers over time, observing movement of members between classes, and outcomes of the subtypes. The application of latent transition analysis, in particular, holds promise for examining class transitions over time and contributing to the prediction of outcome.

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