

## Central Lancashire Online Knowledge (CLoK)

Title	A Latent Profile Analysis of Suicidal and Self-Injurious Behavior, Other Dysregulated Behaviors, and Borderline Personality Disorder Symptoms
Type	Article
URL	<a href="https://clock.uclan.ac.uk/12165/">https://clock.uclan.ac.uk/12165/</a>
DOI	##doi##
Date	2015
Citation	Selby, Edward and Gardner, Kathryn Jane orcid iconORCID: 0000-0003-3904-1638 (2015) A Latent Profile Analysis of Suicidal and Self-Injurious Behavior, Other Dysregulated Behaviors, and Borderline Personality Disorder Symptoms. <i>Journal of Experimental Psychopathology</i> , 6 (4). pp. 356-368. ISSN 2043-8087
Creators	Selby, Edward and Gardner, Kathryn Jane

It is advisable to refer to the publisher's version if you intend to cite from the work. ##doi##

For information about Research at UCLan please go to <http://www.uclan.ac.uk/research/>

All outputs in CLoK are protected by Intellectual Property Rights law, including Copyright law. Copyright, IPR and Moral Rights for the works on this site are retained by the individual authors and/or other copyright owners. Terms and conditions for use of this material are defined in the <http://clock.uclan.ac.uk/policies/>

RUNNING HEAD: LATENT PROFILE ANALYSIS OF BPD

A Latent Profile Analysis of Suicidal and Self-Injurious Behavior, Other Dysregulated Behaviors, and  
Borderline Personality Disorder Symptoms

Edward A. Selby

Rutgers, The State University of New Jersey

Kathryn Gardner

University of Central Lancashire

Correspondence: Please address correspondence to Edward A. Selby, Rutgers University, Department of Psychology, 53 Avenue E., Piscataway, NJ 08854, 848-932-1309, [edward.selby@rutgers.edu](mailto:edward.selby@rutgers.edu)

Conflicts of Interest: None

Acknowledgements: Support was provided for this study, in part, by a NARSAD Young Investigator Grant (PI: Selby) from the Brain and Behavior Research Foundation and Families for Borderline Personality Disorder.

Abstract

Those with borderline personality disorder (BPD) exhibit many dysregulated behaviors, such as non-suicidal self-injury (NSSI), dysregulated eating, and substance use. The purpose of this study was to examine BPD symptoms and levels of these dysregulated behaviors with latent profile analysis, which allows for the empirical investigation of distinct behaviors patterns among those with BPD. A non-clinical student sample was screened for elevated BPD symptoms (N=128, age =18.75 years [SD=1.05], 76.8% female) and used in mixture modeling analyses. Results supported five profiles from the sample, primarily distinguished by suicidality and NSSI: a low BPD-low dysregulated behavior profile, a low BPD profile with elevated suicidality, a low BPD profile with elevated NSSI, a high-BPD with low NSSI and somewhat elevated suicidality, and a high-BPD profile with high NSSI and low suicidality. Follow-up analyses indicated that other dysregulated behaviors did little to distinguish between those with high BPD symptoms. There were also important difference in motivational functions for NSSI between two of the profiles: those with high or low BPD symptoms who self-injured frequently. These findings are relevant to the ongoing debate about the existence of a NSSI disorder distinct from BPD.

Keywords: borderline personality disorder, self-injury, behavioral dysregulation, suicidal ideation, NSSI disorder

## **A Latent Profile Analysis of Suicidal and Self-Injurious Behavior, Other Dysregulated Behaviors, and Borderline Personality Disorder Symptoms**

Borderline personality disorder (BPD) is a chronic and severe disorder characterized by chaotic interpersonal relationships, affective instability, anger control problems, identity diffusion, chronic feelings of emptiness, and importantly, various forms of dysregulated behaviors, including self-injurious and suicidal behavior (DSM-IV, 1994). One of the most salient characteristics of BPD for many with the diagnosis is the presence of non-suicidal self-injury (NSSI) – although self-injurious behavior is not exclusive to those with a BPD diagnosis (Selby et al., 2012). Patients presenting with BPD can often present with different arrays of symptoms (Sanislow & McGlashan, 1998), and one reason for such a diversity of BPD presentation is the presence of various dysregulated behaviors that can satisfy criteria for BPD. In addition to NSSI, other common behaviors can include substance abuse; dysregulated eating behaviors such as bingeing and purging; and interpersonal behaviors such as begging or pleading with someone not to abandon him or her, or verbal and physical aggression. Understanding the different behavioral profiles associated with BPD symptoms, NSSI, and other dysregulated behaviors is important not only for research purposes, but for tailoring treatment approaches in clinical settings.

Researchers have used statistical techniques such as factor analysis and latent class analysis to identify different profiles or subtypes of BPD, and similarly, whether the BPD criteria represent a unitary construct. Recent factor analytic studies of the structure of BPD criteria have found typically solutions that range from three to four factors (Becker, McGlashan, & Grilo, 2006; Blais, Hilsenroth & Castlebury, 1997; Clarkin, Hull & Hurt, 1993; Sanislow, Grilo, & McGlashan, 2000; Selby & Joiner, 2009a) suggesting the possibility of different subtypes, although other studies have either found that all

symptoms loaded onto one general BPD factor (Clifton & Pilkonis, 2007), or reported more factors (e.g., nine: Giesen-Bloo, Wachters, Schouten & Arntz, 2010).

The lack of consistency in factor analytic studies of BPD symptoms suggests that the underlying structure of BPD symptom structure is still at issue. Furthermore, no previous factor analytic studies, to our knowledge, have examined BPD symptoms in relation to NSSI or dysregulated behaviors more specifically. Most studies have examined “impulsivity” as a general symptom category of BPD, but this term may be too heterogeneous given people with BPD can engage in a wide variety of dysregulated behaviors, and the number of behaviors engaged in can vary widely from person to person. People may engage in different behaviors due to different emotional experiences (e.g. more anger versus anxiety experienced may lead to more aggression), different interpersonal environments (e.g., hostile or dismissing), or different early experiences (e.g., abuse – potentially influencing suicidal behavior). Thus, different intra- and interpersonal influences on dysregulated behaviors may alter the manifestation of BPD symptoms in different people.

Mixture modeling, which groups people with similar traits together as opposed to grouping common traits together as factor analysis does, may provide a new way to examine different behavioral patterns of NSSI and BPD at the individual level. In the current study, we attempted to determine if there are certain profiles of people with elevated BPD symptoms who engage in patterns of dysregulated behaviors using latent profile analysis (LPA), a form of mixture modeling. LPA is an extension of latent class analysis that uses continuous variables as indicators of profile membership (Goodman, 1974; Lazarsfeld & Henry, 1968). There is some evidence that LPA has more power for detecting the optimal number of clusters than previous cluster analytic techniques (Magidson & Vermunt, 2002). Thus, LPA identifies profiles that may exist within the broad sample of interest, which makes it an ideal modeling approach to exploring NSSI and other dysregulated behaviors, and

BPD symptoms. Using LPA, we may be able to determine if there are people with high BPD symptoms who behave in one pattern of dysregulated behavior (e.g., substance abuse and binge-eating) versus another pattern (suicidality and reassurance seeking), versus a profile that engages in all of the behaviors. Along these lines, one latent class analysis study found support for a 4-class model with differing levels of BPD symptoms from low to high in a large psychiatric survey (Shelvin et al., 2007). The group with the most BPD symptoms also had the most problems with Axis I comorbidity and adverse life events. Using an inpatient and outpatient clinical population, Fossati et al. (1999) identified three latent classes based on the DSM-IV criteria: in addition to a normative non-BPD class, a second class was a coherent BPD group with probabilities of meeting all BPD criteria, and a third intermediate class met only some BPD criteria (impulsivity and inappropriate anger). Thus, there was evidence of a single class of true BPD subjects, rather than different subtypes, and this was not affected by Axis I comorbidity or patient status (inpatient or outpatient). However, neither of these studies examined specific behavioral patterns (e.g., NSSI, dysregulated eating, etc.).

Although previous mixture modeling and factor analytic research on BPD has investigated latent clustering of symptoms and individuals, most of these studies have included primarily BPD symptoms (e.g., impulsivity and self-injury symptoms), but not other validated measures of dysregulated behaviors. Including additional measures of dysregulated behaviors may allow for further investigation of both the form and frequency of dysregulated behaviors exhibited by individuals with BPD, rather than just their presence or absence. It is important to examine behavioral profiles in BPD because so many dysregulated behaviors are associated with this disorder, and individuals may have a tendency to engage in some behaviors rather than others. Selby and Joiner (2009b) suggest that people with BPD may settle into patterns of behavior that are used as the preferred means to regulate intense negative emotion. Perhaps through trial and error, or influences from moderators such as history of

abuse or availability of social support, people may identify which behaviors have the most effective emotion regulation properties for them and engage in those behaviors the most. Furthermore, difficulty with specific intense negative emotions (e.g. anxiety versus sadness) may lead to more specific behaviors, as in the case of anxiety leading to interpersonal reassurance seeking behaviors, or sadness leading to alcohol use or NSSI.

In the present study we examined the potential for different behavioral profile patterns in a heterogeneous group of undergraduates assessed for BPD symptoms, NSSI, and other dysregulated behaviors using LPA. For the other dysregulated behaviors examined, we explored dysregulated eating behaviors, substance use, and dysregulated interpersonal behavior because each one maps onto BPD symptoms (i.e., impulsivity, or in the latter case frantic efforts to avoid abandonment), and each has been found to correlate with BPD symptoms in previous studies (see Selby et al., 2009). However, there are a number of additional dysregulated behaviors associated with BPD that could be also examined with such analyses. Because these analyses were exploratory, we refrained from hypothesizing the number or types of behavioral profiles that would emerge from the analysis, with the exception that there would be at least one “control” profile endorsing low levels of BPD symptoms and low behavioral dysregulation (as was found in the previous study by Clifton and Pilkonis [2007]). Upon establishing profiles, we then examined differences in functional motivations for NSSI, to further distinguish potential profile patterns. Consistent with literature using non-BPD samples (see Klonsky, 2007, for review), individuals with BPD report both intrapersonal and social functions of NSSI, but social functions are typically endorsed less frequently (Brown, Comtois & Linehan, 2002; Klonsky & Glenn, 2008). Nock (2008) argues that individuals who engage in NSSI for social reasons do so because ‘actions speak louder than words’ when attempting to elicit caregiving. Moreover, the ‘signal of distress hypothesis’ postulates that individuals resort to NSSI when low intensity signals of

distress (e.g., excessive reassurance-seeking) are no longer successful in eliciting caregiving responses (Nock, 2008). Thus, there may be a subgroup of BPDs for which social functions are important, consistent with evidence that BPD is associated with higher levels of excessive reassurance seeking (Selby et al., 2009).

## Methods

### Participants

Participants consisted of 128 undergraduate students, 30 men (23.2%) and 98 women. All were students at a large southern university, and the sample was recruited to be enriched with people reporting symptoms of BPD. In this recruitment strategy, all students in the university undergraduate psychology subject pool ( $N > 5,000$ ) were screened with nine items from the SCID-II screening questions (SCID-II; First et al., 1997); those who endorsed five or more symptoms of BPD were invited first and given first priority for entry into the study. People scoring below 5 were later allowed to participate as well in order to provide control participants. With this screening procedure, we were able to recruit 39 participants with BPD to the study (27% of the sample), and many more with subthreshold symptoms. All participants received course credit for the study. Additional details about the screening procedures and participant recruitment can be found in Selby, Anestis, Bender, and Joiner (2009).

Participant ages ranged from 18 to 24 with an average age of 18.75 ( $SD = 1.05$ ). Ethnicity was 69% Caucasian, 14.1% Hispanic, 10.6% African-American, 2.8% Asian, 2.1% Native American, and 1.4% other. With regard to self-reported socio-economic status (SES), 4.4% of participants reported being from low SES, 72.8% reported being from middle SES, and 22.8% reported being from high

SES. The university IRB approved this study, and all participants provided full, informed, and written consent to participate in all aspects of the study.

### Procedures

All participants completed a battery of behavioral questionnaires and engaged in a structured clinical interview. Interviews were conducted by trained graduate students in psychology. All interviews were cross-checked by masters-level clinicians to ensure that symptoms endorsed for each participant adequately met full symptom threshold or not. If there were disagreements, the first reviewer consulted with the second reviewer as to whether the participant was appropriately rated for the symptom and a consensus was reached.

### Structured Interview

*Structured Clinical Interview for Diagnosis of DSM-IV Axis II Personality Disorders* (First et al., 1997). All participants were administered structured clinical interviews for the borderline personality disorder. People were rated present or absent for each symptom of BPD. If an interviewer was uncertain as to whether a symptom met threshold level, then he or she consulted with another reviewer and the study PI to determine if the rating of the symptom was appropriate. Because this approach was taken to coding the diagnostic interviews, data on inter-rater reliability were unable to be calculated. In the current study, BPD symptoms on the SCID-II were rated from 1-3 (1-symptom not present; 2-subthreshold symptom; 3-symptom present) for each diagnostic criterion out of nine. These scores were then summed to create a continuous, dimensional variable for BPD symptoms and to account for those with subthreshold symptoms, and could thus range from 9 to 27; this scale was used in the LPA. The use of a continuous measure of BPD symptoms that includes sub-threshold symptoms

is also important given that evidence suggests BPD may be non-taxonic (Rothschild, Cleland, Haslam, & Zimmerman, 2003). The Cronbachs alpha for the continuous measure of BPD was  $\alpha=.80$ . The sample mean for BPD symptoms was 14.4 (SD=4.9).

### Reports of Dysregulated Behaviors

The following scales were used as indicators of dysregulated behavior in latent profile analysis to measure difficulties with NSSI, suicidal ideation, dysregulated eating behaviors, problematic substance use, and dysregulated interpersonal behavior. Importantly, each of the scales used to measure these behaviors has been found to correlate with BPD symptoms (Selby et al., 2009).

The *Functional Assessment of Self-Mutilation* (FASM; Lloyd et al., 1997) is a self-report questionnaire that assesses the degree to which participants have engaged in a variety of self-injurious behaviors (e.g. cutting/carving, burning) during the course of the previous year, as well as the reasons for which participants engaged in each of those behaviors. Participants were given a list of 22 reasons (e.g. to get attention, to stop bad feelings) to choose from to explain their motives for engaging in each behavior; each of these motivations is rated on a likert scale indicating how frequently this motivation applies to their NSSI behavior (0=never, 3=often). For the LPA analyses we used only NSSI frequency. After establishing latent profiles, we then compared the profiles on ratings of NSSI motivations, while controlling for each individual's NSSI frequency. In the present sample, the average report was 5.7 NSSI episodes (SD=16.8), and reports ranged from 0 to 105.

The *Beck Scale for Suicide Ideation* (BSS; Beck, Steer, & Ranieri, 1988) is a 21-item self-report measure used to determine various facets of risk for suicidal behavior. Previous studies have found this scale to acceptable internal consistency ( $\alpha=.87$ ) and test-retest reliability ( $r=.54$ ; Beck & Steer, 1993). Respondents rate their current level of symptoms on a 3-point scale, from 0 to 2, with

higher scores indicative of greater risk. Items are aimed at rating symptoms such as suicidal ideation and plans and preparation, and past attempts. All participants received a total score for the BSS, and in the current sample it demonstrated good internal consistency ( $\alpha = .91$ ). BSS scores in this sample averaged 1.58 (SD=4.20), with scores ranging from 0 to 25.

The *Depressive Interpersonal Relationships Inventory – Reassurance Seeking subscale* (DIRI-RS; Joiner, Alfano, & Metalsky, 1992) is a four item Likert scale (1=no not at all, to 7=yes, very much) that measures the degree to which people seek reassurance from others, and the impact those behaviors may have on their relationships with others. This scale was included to map onto the dysregulated interpersonal behaviors often observed in BPD (e.g., fear of abandonment, begging, pleading). In this sample, the internal consistency was  $\alpha = .88$  and the average reassurance seeking score was 12.5 (SD=5.8), with scores ranging from 4 to 26.

The *Eating Disorder Inventory* (EDI; Garner, Olmstead, & Polivy 1983) is a self-report questionnaire that measures the degree to which participants exhibit pathological eating behaviors and thoughts. In this study, we utilized the *Bulimia subscale*, which assesses the degree to which people engage in binge eating and purging behaviors. Individual items use a Likert scale (1=strongly agree 5=strongly disagree) and the internal validity of the measure has been widely reported. The alpha for the Bulimia subscale was  $\alpha = .84$ . This scale was included because a large number of people with BPD report difficulties with dysregulated eating behaviors (Selby, Ward, & Joiner, 2010). In this sample, the average score for this subscale was 15.1 (SD=6.4), with scores ranging from 7 to 39.

The *Drinking Motives Questionnaire* (DMQ; Cooper et al. 1992) assesses the degree to which participants consume alcohol for different motives. The scale consists of three dimensions: coping motives, enhancement motives, and social motives. Each dimension is measured with five questions and the individual test items utilize a Likert style format rating from 1 (almost never/never) to 4

(almost always). In this study, we utilized only the Coping subscale, which assesses the degree to which participants consume alcohol explicitly to reduce sensations of negative affect. This scale was included as abusing substances is often a behavioral feature of many with BPD (Trull et al., 2000). The alpha for this scale was  $\alpha = .87$ , and the average score in this sample was 10.7 (SD=4.6), with scores ranging from 5-20.

### Data Analytic Strategy

Data were analyzed using MPlus (Muthén & Muthén, 2004). In LPA, a model is judged to be of adequate or good fit based on a combination of statistical considerations. In judging model fit for this study, the Bayesian information criterion (BIC; Schwartz, 1978) and sample-size adjusted BIC (ABIC; Sclove, 1987) were given the most weight in judging model fit, because simulation studies have found evidence that the BIC provides the most accurate fit (Nylund et al., 2007). The Akaike information criterion (AIC; Akaike, 1987) was also used to determine model fit, with lower levels indicating better parsimony for the model, as there is a better fit relative to number of parameters estimated. The Vuong-Lo-Mendall-Rubin likelihood test (VLMR; Lo, Mendall, & Rubin, 2001; Vuong, 1989) was used to determine if each successive number of profiles provided a better fit to the data than the lower profile model nest within it (i.e. is a five profile model significantly better than a four profile model). A non-significant VLMR ( $p > .05$ ) indicates that a model does not provide better fit than a nested model with one less profile. Entropy was also used as an indicator of model fit. Entropy provides information about how well the model classifies people, with values closer to or exactly 1 indicating that the classification of the model was more accurate for placing the correct participants in each profile, and if the model has a high probability of replication. The models explored in these analyses were known to be identified because they are recursive. The covariance of

coverage for all variables was 1.0, which is well above minimum thresholds for establishing adequate covariance coverage (e.g., .10; Muthén & Muthén, 2004).

## Results

### **Latent Profile Analyses**

A series of LPA analyses were conducted to determine which number of profiles provided the best fit to the data. We explored from one to six profiles, as there were six indicator variables. These indicators consisted of the continuous measure of symptoms of BPD, as well as excessive reassurance seeking (DIRI), dysregulated eating behaviors (EDI), drinking to cope (COPE), non-suicidal self-injurious behavior (NSSI), and suicidality (BSS). The results of the profile pattern analyses are displayed in Table 1. We judged the best solution to be the one with the lowest AIC, BIC, ABIC scores and the highest entropy.

Based on these considerations, the six-profile model appeared to provide the best fit to the data. But, because one of the 6 profiles consisted of only one member, we determined that the five-profile model was the most appropriate solution. The five-profile model had the lowest AIC, BIC, and ABIC, and it also had a high entropy value, indicating that there was little overlap between profiles. Because the five-profile model provided significant better fit than a four-profile solution ( $VLMR < .001$ ), and the four-profile solution provided better fit than the three-profile solution ( $VLMR < .001$ ), we decided that the five-profile solution was the most accurate representation of the data. The precision probability for each participant being assigned to his or her appropriate profile ranged from good ( $p = .94$  for Profile 2) to exact precision ( $p = 1.0$  for Profiles 4 and 5). The means and standard deviations of each indicator for each profile are displayed in Table 2. In order to display the differences between levels of BPD and dysregulated behaviors according to each profile, the mean and standard deviation

for each indicator for each profile was converted into a t-score relative to the sample mean. This conversion allowed for a standardized comparison of each profile level of indicator as compared to the entire sample mean. These t-scores are displayed in Figure 1 and aid in an overall understanding of the different profiles. Based on the exploratory nature of these analyses and the low power for some profiles, we did not correct for multiple comparisons in our comparisons of the profiles.

The five profiles that emerged primarily involved differences in level of BPD symptoms, NSSI frequency, and level of suicidal ideation. Interestingly, differences between the other dysregulated behaviors were not primary in the separation between profiles. There were two profiles with low BPD symptoms and neither exhibited much elevated dysregulated behavior (Profiles 1 and 5), although Profile 5 had somewhat elevated suicidal ideation; one profile exhibited low BPD symptoms, high levels of NSSI, and generally lower levels of other dysregulated behaviors (Profile 4). Finally, two high BPD profiles emerged, one with high levels of NSSI (Profile 3) and the other with low levels of NSSI (Profile 2). Profile 1 (N=74) consisted of a people who scored below the sample mean for BPD symptoms, as well as most of the dysregulated behavior indicators. This profile was expected based on our sample, and made up 58% of the sample. This profile consisted of 60% women, and there were none in this profile with diagnoses of BPD.

Profile-2 (N=34) could be considered a High BPD, Low NSSI profile and consisted of people who displayed high BPD symptoms, significantly more so than Profile-1 ( $t=9.28$ ,  $df=106$ ,  $p<.001$ ). This profile made up 27% of the sample, 82% were women, and 22 had diagnoses of BPD. This profile also displayed elevated levels of excessive reassurance seeking ( $t=5.67$ ,  $df=106$ ,  $p<.001$ ), drinking to cope ( $t=3.07$ ,  $df=106$ ,  $p<.01$ ), dysregulated eating ( $t=2.71$ ,  $p<.01$ ,  $df=106$ ), and suicidality ( $t=42.80$ ,  $df=106$ ,  $p<.001$ ), all relative to Profile-1.

Profile-3 (N=10) could be considered a High BPD, High NSSI profile and consisted of people who displayed high BPD symptoms, the highest BPD symptoms of all of the profiles, although symptoms were only significantly higher than Profile-1 ( $t=5.86$ ,  $df=82$ ,  $p<.001$ ). This profile made up 8% of the sample; 100% were women, and all had diagnoses of BPD. Members of this profile displayed less suicidality relative to Profile-2 ( $t=20.63$ ,  $df=42$ ,  $p<.001$ ), but more NSSI relative to Profile-2 ( $t=85.57$ ,  $df=42$ ,  $p<.001$ ). This profile also reported high levels of excessive reassurance seeking ( $t=5.15$ ,  $df=82$ ,  $p<.001$ ) and dysregulated eating behaviors ( $t=3.19$ ,  $df=82$ ,  $p<.01$ ), but not drinking to cope, relative to Profile-1.

Profile 4 (N=4) consisted of another profile of people with low BPD symptoms, and could be considered a Low BPD, High NSSI profile. This profile made up 3% of the sample. 75% of the participants were women, and 3 had diagnoses of BPD. Similar to Profile-3, this profile endorsed high levels of excessive reassurance seeking ( $t=3.54$ ,  $df=76$ ,  $p<.001$ ) and NSSI ( $t=274.40$ ,  $df=76$ ,  $p<.001$ ), relative to Profile-1. Furthermore, this profile had significantly higher NSSI than Profile-2 ( $t=125.29$ ,  $df=36$ ,  $p<.001$ ), Profile-3 ( $t=66.04$ ,  $df=12$ ,  $p<.001$ ), and Profile-5 ( $t=5.24$ ,  $df=8$ ,  $p<.001$ ). It was also higher on suicidality than Profile-1 ( $t=64.46$ ,  $df=76$ ,  $p<.001$ ), Profile-2 ( $t=44.77$ ,  $df=36$ ,  $p<.001$ ), and Profile-3 ( $t=53.90$ ,  $df=12$ ,  $p<.001$ ). The small size of this profile brings into question the validity of this profile; although small, this profile demonstrated not only a unique behavioral pattern, but also an extreme one, with extremely high levels of NSSI relative to all other profiles. Given its uniqueness, we felt this was a distinct profile and that collapsing into another profile wasn't warranted, given the model fit indices in Table 1.

The final profile (Profile 5) consisted of a second profile of people with low BPD symptoms, although higher than Profile-1 ( $t=2.94$ ,  $df=78$ ,  $p<.001$ ). This profile consisted of 6 people and made up 5% of the sample; 67% were women and 4 had diagnoses of BPD. Interestingly, this profile had higher

suicidality than Profile-1 ( $t=6.39$ ,  $df=78$ ,  $p<.001$ ) and Profile-2 ( $t=3.55$ ,  $df=38$ ,  $p<.001$ ), but it did not have significantly higher NSSI than the other profiles.

### **Profile Differences on Motivations for Non-Suicidal Self-Injury**

The primary LPA indicated that the major factors distinguishing between profiles were NSSI and level of suicidal ideation. To provide further information on the relevance and importance of these profiles, we explored whether functional motivations for NSSI distinguished the profiles. To do this, we conducted ANCOVA analyses using the FASM motivation ratings as the outcome variables, while simultaneously controlling for NSSI frequency. It was important to control for NSSI frequency because if an individual engaged in NSSI only a few times and rated that specific motivation highly, then that individual would have a higher score than someone who self-injured frequently but may have rated that specific motivation somewhat lower, potentially due to having multiple motivations.

Omnibus ANCOVA analyses were then conducted with the five LPA profile memberships to examine if there were profile differences in NSSI motivation ratings. Due to the exploratory nature of these analyses, we did not control for multiple comparisons so that these findings can guide future studies. Because three of the profiles indicated low levels of NSSI (the two control profiles [Profile 1 and 5] and the BPD profile with low NSSI [Profile 2]), we only examined and reported the contrasts for High BPD, High NSSI (Profile 3) and Low BPD, High NSSI (Profile 4). Of the various FASM functions for NSSI, only two significant findings emerged. First, there was a significant difference for the FASM motivation “to get control of a situation,” such that those with High BPD, High NSSI ( $M=1.31$ ,  $SD=1.25$ ) reported higher levels of this motivation than those in the Low BPD, High NSSI profile ( $M=.44$ ,  $SD=.80$ ;  $F(1,11)= 10.22$ ,  $p<.001$ ,  $d= 1.9$ ), after controlling for NSSI frequency. The second significant difference emerged for the FASM motivation “to stop bad feelings,” such that the

High BPD, High NSSI profile ( $M=1.23$ ,  $SD=1.30$ ) reported higher levels of this motivation than those in the Low BPD, High NSSI profile ( $M=.22$ ,  $SD=.67$ ;  $F(1,11)=7.17$ ,  $p<.05$ ,  $d=1.6$ ), after controlling for NSSI frequency. These findings, although preliminary and exploratory, suggest that there may be some differences in motivations for NSSI for those with BPD and those without BPD.

### **Latent Profile Analysis of Non-Self-Injury Dysregulated Behaviors**

Because NSSI and suicidality were the major factors that drove the primary LPA and the other dysregulated behaviors did not substantially differentiate profiles, we conducted a second LPA analysis with the same variables but this time excluding NSSI and suicidality as variables. This analysis allowed us to examine if the remaining dysregulated behaviors (excessive reassurance seeking, drinking to cope, or eating disorder symptoms) presented differently among those with elevated but not high BPD symptoms. This series of analyses indicated that the best solution was a two profile solution ( $AIC=3139.60$ ,  $VLMR=BIC=3176.67$ ,  $ABIC=3135.56$ ,  $Entropy=.85$ ), which fit substantially better than a one profile solution ( $AIC=3205.45$ ,  $BIC=3228.27$ ,  $ABIC=3202.97$ ;  $VLMR < .001$ ). A three profile solution fit better than the two profile solution ( $AIC=3107.70$ ,  $BIC=3159.03$ ,  $ABIC=3102.11$ ,  $Entropy=.91$ ;  $VLMR < .001$ ); however, in this solution one of the profiles contained only one individual. Thus, the most parsimonious solution was a two-profile solution. The means and standard deviations of the profile components from this analysis are displayed in Table 3. As can be seen in this analysis, the two profiles that emerged were essentially a control profile (e.g., generally low BPD symptoms and low scores on the dysregulated variables) and a BPD profile with elevated BPD symptoms and significantly higher scores on all of the dysregulated behaviors. The conclusion from this analysis was that elevated BPD was associated with the presence of dysregulated behaviors

in general (multiple forms of behavior), rather than BPD being associated with different non-NSSI behavioral profiles.

## Discussion

The purpose of this study was to examine the profiles of people reporting NSSI, other dysregulated behaviors, and symptoms of BPD. The results of the study found evidence for five profiles, with three being of particular interest: 1) a High BPD, Low NSSI profile; 2) a High BPD, High NSSI profile, and 3) a Low BPD, High NSSI profile. Our finding that NSSI loaded differently onto BPD and non-BPD profiles was interesting, given that Shelvin et al. (2007) found that NSSI loaded only on the profile with the highest BPD symptoms. The findings of this study provide preliminary evidence that there may be different profiles of people with BPD, and one of the primary differences may be in levels of NSSI and suicidality (i.e. including current ideation and a past suicide attempt). Based on the primary profile analysis and a follow-up analysis, levels of other dysregulated behaviors (e.g., excessive reassurance seeking, dysregulated eating behaviors, and drinking to cope) did not distinguish between those with elevated BPD symptoms. Instead, these behaviors were elevated across the board for those with elevated BPD, rather than differentially elevated for different profiles of BPD.

The clearest finding in this study was that NSSI and suicidality served as the primary distinguishing factors between the high BPD profiles. The “typical” BPD patient is thought to exhibit high suicidality and high NSSI, yet as the findings from this study show that may only be the most severe patients with BPD. On the other hand, there may be some BPD patients with elevated BPD symptoms who exhibit NSSI without elevated suicidal ideation. Further research should examine the finding of this study that some may exhibit high levels of NSSI and low levels of suicidality, since

NSSI is often a risk factor for suicidal behavior and may contribute to one's acquired capability to make a serious suicide attempt (Franklin et al., 2011). These findings may also shed some light on the "antisuicide" function of NSSI, which posits that NSSI is often used as a compromise to enacting suicidal desire in that it damages one's body without being fatal (see Klonsky, 2007 for more detail on this and other postulated functions of NSSI). The findings of the current study suggest that this motivation may be less likely for those with low BPD symptoms who self-injure since the Low BPD, High NSSI profile had only moderately elevated levels of suicidality. On the other hand, the High BPD, High NSSI profile also had high levels of suicidal ideation, suggesting that this function may be more involved in this profile of individuals. Unfortunately, the FASM does not measure the antisuicide function of NSSI, so we were unable to further examine this issue in the current study.

Another important finding in this study was that in addition to the two profiles exhibiting elevated BPD, there was an additional profile exhibiting low BPD symptoms with elevated levels of NSSI. This finding is interesting because NSSI is often clinically thought as a distinguishing feature of BPD. However, recent evidence suggests that there are a large number of people who engage in NSSI and exhibit low symptoms of BPD (Selby et al., 2012), leading to some notions that a distinct NSSI disorder should be classified in the next version of the DSM (Selby et al., 2012; Zetterqvist et al., 2013; Glenn & Klonsky, in press). The findings of this study provide some additional support that there may be a profile of individuals with elevated NSSI frequency, low suicidality, and low BPD symptoms, which are major features of the proposed NSSI disorder.

Another interesting contribution of the current study was that when the profiles were compared on functional motivations for NSSI, interesting differences emerged between the High BPD, High NSSI, and Low BPD, High NSSI profiles. When these two profiles were compared on the functional motivations of NSSI, the high BPD profile reported more motivation for using NSSI to "get control of

a situation” and “to stop bad feelings,” even after accounting for NSSI frequency. These findings provide some additional evidence that there may be important differences in the motivations for NSSI between those who self-injure with and without BPD, also suggesting some potential validity to NSSI disorder (Selby et al., 2012). However, given the exploratory nature of these analyses and low power for comparing the groups, these analyses should be viewed in light of these limitations.

There were some limitations to this study that should be noted. One important limitation was that the power for this study was somewhat low. Although the LPA analysis indicated that the six-profile was the best fit, one of the profiles only had one person in it. This same issue may have applied to the 5-profile model, which had 4- and 6- person profiles, but these profiles exhibited clearly unique behavioral differences that suggested they may be valid. Conducting a LPA on these same variables with a larger sample is needed for replication of the three primary profiles obtained in our model. Another important limitation to this study was that all of the participants were college students and none were directly recruited from a clinical setting. These findings should be replicated in clinical samples as well.

Another limitation was that a wider array of dysregulated behaviors was not used in the analyses. Because there are far more dysregulated behaviors that were not used in this study, such as aggression and other forms of substance abuse, there may be other profiles of BPD and dysregulated behaviors than those identified in this study. In addition, the use of a dimensional symptom count variable of BPD symptoms derived from a clinical interview such as the SCID-II, rather than using a BPD-specific self-report measure, may be a limitation. This is because there may be some concerns about reliability, with previous studies finding only medium inter-rater agreements for scoring SCID-II items (Maffei et al., 1997), although some other studies have found better inter-rater reliability for dimensional BPD diagnoses established with the SCID-II (Lobbestael et al., 2011). Thus, future

studies examining latent profile analyses for BPD symptoms might benefit from using BPD self-report measures to create dimensional scores. Finally, because this was an exploratory study we did not control for multiple comparisons; accordingly some of the findings may be due to Type I error rather than true profile differences.

The results of this study have important clinical implications. First, not all people with BPD present in the same way, and there can be important differences in presence or absence of NSSI and suicidal ideation, as well as severity of these issues. Thus, further research should examine if there are important differences in those with BPD given a suicidal versus non-suicidal qualifier. Clearly, different treatment approaches are needed depending on the profile of the individual. Furthermore, some may present with elevated levels of NSSI and few symptoms of BPD. This is important, given NSSI is thought of as a prototypically BPD symptom. This has implications for the validity of a potential NSSI disorder, which preliminary evidence suggest has a differential treatment response and better prognosis than those diagnosed with BPD (Ward et al., 2012).

## References

- Akaike, H. (1987). Factor analysis and AIC. *Psychometrika*, *52*, 317-332.
- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders*, fourth edition. Washington, D.C.: Author.
- Beck, A. T., & Steer, R. A. (1993). Beck Scale for Suicide Ideation. San Antonio, TX: Psychological Corporation.
- Beck, A. T., Steer, R. A., & Ranieri, W. F. (1988). Scale for suicide ideation: psychometric properties of a self-report version. *Journal of Clinical Psychology*, *44*, 499-505.
- Becker, D. F., McGlashan, T. H., & Grilo, C. M. (2006). Exploratory factor analysis of borderline personality disorder criteria in hospitalized adolescents. *Comprehensive Psychiatry*, *47*, 99-105.
- Blais, M. A., Hilsenroth, M. J., & Castlebury, F. D. (1997). Content validity of the DSM-IV borderline and narcissistic personality disorder criteria sets. *Comprehensive Psychiatry*, *38*, 31-37.
- Brown, M. Z., Comtois, K. A., & Linehan, M. M. (2002). Reasons for suicide attempts and nonsuicidal self-injury in women with borderline personality disorder. *Journal of Abnormal Psychology*, *111*(1), 198-202.
- Clarkin, J. F., Hull, J. W., & Hurt, S. W. (1993). Factor structure of borderline personality disorder criteria. *Journal of Personality Disorders*, *7*, 137-143.
- Clifton, A., & Pilkonis, P. A. (2007). Evidence for a single latent class of Diagnostic and Statistical Manual of Mental Disorders borderline personality disorder. *Comprehensive Psychiatry*, *48*, 70-78.
- Cooper, M. L., Russell, M., Skinner, J. B., & Windle, M. (1992). Development and Validation of a Three-Dimensional Measure of Drinking Motives. *Psychological Assessment: Journal of Consulting and Clinical Psychology*, *4*, 123-132.

- First, M. B., Spitzer, R. L., Gibbon, M., Williams, J. B. W., & Benjamin, L. (1997). *Structured Clinical Interview for DSM-IV Personality Disorders (SCID-II)*. Washington, DC: American Psychiatric Publishing.
- Fossati, A., Maffei, C., Bagnato, M., Donati, D., Namia, C., & Novella, L. (1999). Latent structure analysis of DSM-IV borderline personality disorder criteria. *Comprehensive Psychiatry, 40*, 72-79.
- Franklin, J. C., Hessel, E. T., Prinstein, M. J. (2011). Clarifying the role of pain tolerance in suicidal capability. *Psychiatry Research, 189*, 362-367.
- Garner, D.M., Olmstead, M.P., & Polivy, J. (1983) Development and Validation of a Multidimensional Eating Disorder Inventory for Anorexia Nervosa and Bulimia. *International Journal of Eating Disorders, 2*, 15–19.
- Giesen-Bloo, J. H., Wachters, L. M., Schouten, E., & Arntz, A. (2010). The Borderline Personality Disorder Severity Index-IV: Psychometric evaluation and dimensional structure. *Personality and Individual Differences, 49*(2), 136-141.
- Glenn, C. R., & Klonsky, E. D. (in press). Nonsuicidal self-injury disorder: An empirical investigation in adolescent psychiatric patients. *Journal of Clinical Child & Adolescent Psychology*.
- Goodman, L. (1974). Exploratory latent structure analysis using both identifiable and unidentifiable models. *Biometrika, 61*, 215-231.
- Joiner, T. E., Alfano, M. S., & Metalsky, G. I. (1992). When depression breeds contempt. *Journal of Abnormal Psychology, 101*, 165-173.
- Klonsky, E. D. (2007). The functions of deliberate self-injury: A review of the evidence. *Clinical psychology review, 27*, 226-239.

- Klonsky, D. E., & Glenn, C. R. (2009). Assessing the functions of non-suicidal self-injury: psychometric properties of the Inventory of Statements About Self-injury (ISAS). *Journal of Psychopathology and Behavioral Assessment, 31*, 215-219.
- Lazarsfeld, P., & Henry, N. (1968). *Latent structure analysis*. Boston: Houghton Mifflin.
- Lloyd, E., Keeley, M.L., & Hope, T. (1997). Self-mutilation in a sample of community adolescents: Descriptive characteristics and provisional prevalence rates. Poster presented at the Society of Behavioral Medicine, New Orleans, March 17.
- Lo, Y., Mendall, N. R., & Rubin, D. B. (2001). Testing the number of components in a normal mixture. *Biometrika, 88*, 767-778.
- Lobbestael, J., Leurgans, M., & Arntz, A. (2011). Inter- rater reliability of the structured clinical interview for DSM- IV axis I disorders (SCID I) and axis II disorders (SCID II). *Clinical Psychology & Psychotherapy, 18*(1), 75-79.
- Maffei, C., Fossati, A., Agostoni, I., Barraco, A., Bagnato, M., Deborah, D., ... & Petrachi, M. (1997). Interrater reliability and internal consistency of the structured clinical interview for DSM-IV axis II personality disorders (SCID-II), version 2.0. *Journal of Personality Disorders, 11*(3), 279-284.
- Magidson, J., & Vermunt, J. (2002). Latent class models for clustering: A comparison with K-means. *Canadian Journal of Marketing Research, 20*, 37-44.
- Muthén, L. & Muthén, B. (2004). *MPlus user's guide*. Los Angeles, CA: Author.
- Nock, M. K. (2008). Actions speak louder than words: An elaborated theoretical model of the social functions of self-injury and other harmful behaviors. *Applied and Preventive Psychology, 12*, 159-168.
- Nylund, K., Muthén, B., & Asparouhov, T. (2007). Deciding on the number of classes in latent class analysis: A Monte Carlo simulation study. *Structural Equation Modeling, 14*, 535-569.

- Rothschild, L., Cleland, C., Haslam, N., & Zimmerman, M. (2003). A Taxometric study of borderline personality disorder. *Journal of Abnormal Psychology, 112*(4), 657-666.
- Sanislow, C. A., Grilo, C. M., & McGlashan, T. H. (2000). Factor analysis of the DSM-III-R borderline personality disorder in psychiatric inpatients. *American Journal of Psychiatry, 157*, 1629-33.
- Sanislow C. A., & McGlashan, T. H. (1998). Treatment outcome of personality disorders. *Canadian Journal of Psychiatry, 43*, 237-50.
- Schwartz, G. (1978). Estimating the dimensions of a model. *Annals of Statistics, 6*, 461-464.
- Sclove, L. S. (1987). Application of a model-selection criteria to some problems in multivariate analysis. *Psychometrika, 52*, 333-343.
- Selby, E. A., Anestis, M. D., Bender, T. W., & Joiner, T. E., Jr. (2009). An exploration of the emotional cascade model in borderline personality disorder. *Journal of Abnormal Psychology, 118*, 375-387.
- Selby, E. A., Bender, T. W., Gordon, K. H., Nock, M. K., & Joiner Jr, T. E. (2012). Non-suicidal self-injury (NSSI) disorder: A preliminary study. *Personality Disorders: Theory, Research, and Treatment, 3*, 167-175.
- Selby, E. A., & Joiner, T. E., Jr. (2009a). Ethnic variations in the structure of borderline personality disorder symptomatology. *Journal of Psychiatric Research, 43*, 115-123.
- Selby, E. A., & Joiner, T. E., Jr. (2009b). Cascades of emotion: The emergence of borderline personality disorder from emotional and behavioral dysregulation. *Review of General Psychology, 13*, 219-229.

- Selby, E. A., Ward, A. C., & Joiner, T. E. (2010). Dysregulated eating behaviors in borderline personality disorder: Are rejection sensitivity and emotion dysregulation linking mechanisms? *International Journal of Eating Disorders, 43*, 667-670.
- Shevlin, M., Dorahy, M., Adamson, G., & Murphy, J. (2007). Subtypes of borderline personality disorder, associated clinical disorders and stressful life-events: A latent class analysis on the British Psychiatric Morbidity Survey. *British Journal of Clinical Psychology, 46*, 273-281.
- Soloff, P. H., & Fabio, A. (2008). Prospective predictors of suicide attempts in borderline personality disorder at one, two, and two-to-five year follow-up. *Journal of Personality Disorders, 22*, 123-134.
- Trull, T. J., Sher, K. J., Minks-Brown, C., Durbin, J., & Burr, R. (2000). Borderline personality disorder and substance use disorders: a review and integration. *Clinical Psychology Review, 20*, 235-253.
- Vuong, Q. H. (1989). Likelihood ratio tests for model selection and non-nested hypotheses. *Econometrica, 57*, 307-333.
- Ward, A., Bender, T. W., Gordon, K. H., Nock, M. K., Joiner, T. E., & Selby, E. A. (2012). Post-therapy functional impairment as a treatment outcome measure in non-suicidal self-injury disorder using archival data. *Personality and Mental Health, 7*, 69-79.
- Zetterqvist, M., Lundh, L. G., Dahlström, Ö., & Svedin, C. G. (2013). Prevalence and function of non-suicidal self-injury (NSSI) in a community sample of adolescents, using suggested DSM-5 criteria for a potential NSSI disorder. *Journal of Abnormal Child Psychology, 41*, 759-773.

Table 1

Model Fit Indices for 1- to 6-Profile Solutions

Model	AIC	BIC	ABIC	VLMR	Entropy
1-Profile	5363.62	5397.84	5359.84	--	--
2-Profiles	5211.90	5266.09	5206.00	<.001	.999
3-Profiles	5074.80	5148.95	5066.72	<.001	.998
4-Profiles	5011.77	5105.89	5001.52	<.001	.925
<b>5-Profiles</b>	<b>4932.43</b>	<b>5046.51</b>	<b>4920.01</b>	<b>&lt;.001</b>	<b>.928</b>
<u>6-Profiles</u>	<u>4895.54</u>	<u>5029.58</u>	<u>4880.94</u>	<u>&lt;.001</u>	<u>.942</u>

Note: N=128. AIC = Akaike information criterion; BIC = Bayesian information criterion; ABIC = sample size adjusted Bayesian information criterion; VLMR= Vuong-Lo-Mendall-Rubin test; bold indicates the model that was selected for best fit.

Table 2

Means and Standard Deviations of Indicators for 5-Profile Solution

<b>Profile</b>	<b>BPD</b>	<b>DIRI</b>	<b>COPE</b>	<b>EDI</b>	<b>NSSI</b>	<b>BSS</b>
	<i>Mean (SD)</i>	<i>Mean (SD)</i>	<i>Mean (SD)</i>	<i>Mean (SD)</i>	<i>Mean (SD)</i>	<i>Mean (SD)</i>
Profile-1	11.02(4.37)	9.60(5.14)	9.93(4.74)	13.34(6.01)	1.89(0.61) <sup>b</sup>	0.73(0.32)
Profile-2	19.31(4.19) <sup>a</sup>	15.68(5.35) <sup>a</sup>	12.89(4.62) <sup>a</sup>	16.64(5.59) <sup>a</sup>	1.46(1.41)	3.39(0.31) <sup>ac</sup>
Profile-3	19.62(4.21) <sup>a</sup>	18.48(5.43) <sup>a</sup>	10.08(4.78)	19.71(5.64) <sup>a</sup>	28.68(1.75) <sup>ab</sup>	1.3(0.20) <sup>a</sup>
Profile-4	15.00(1.67)	18.75(2.90) <sup>a</sup>	10.75(4.24)	14.75(5.31)	94.75(1.49) <sup>abcd</sup>	11.00(0.49) <sup>abc</sup>
<u>Profile-5</u>	<u>16.50(4.72)<sup>a</sup></u>	<u>14.83(5.76)</u>	<u>11.00(4.63)</u>	<u>13.17(6.72)</u>	<u>5.50(27.97)</u>	<u>16.45(22.88)<sup>ab</sup></u>
<u>Sample</u>	<u>14.38(4.93)</u>	<u>12.51(5.77)</u>	<u>10.84(4.60)</u>	<u>14.79(6.43)</u>	<u>6.93(16.78)</u>	<u>4.27(3.87)</u>

Note: Sample N = 128, Profile-1 N=74, Profile-2 N=34, Profile-3 N=10, Profile-4 N=4, Profile-5 N=6;

BPD = borderline personality disorder symptoms, DIRI= excessive reassurance seeking, COPE=

drinking to cope, EDI = Eating Disorder Inventory- Bulimia subscale, NSSI = non-suicidal self-injury,

BSS= Beck Scale for Suicidal Ideation; a=significantly greater than Profile-1, b=significantly greater

than Profile-2, c=significantly greater than Profile-3, d= significantly greater than Profile-5.

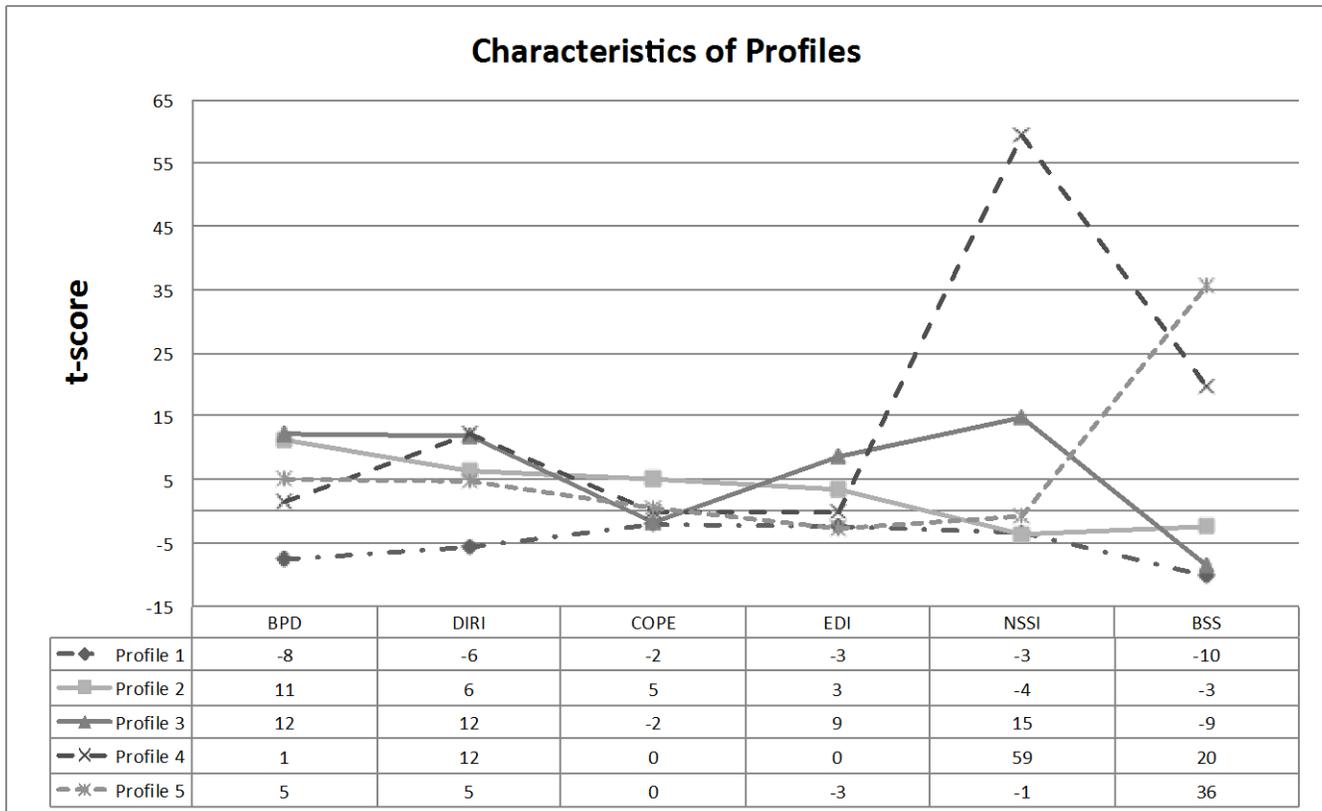
Table 3  
Means and Standard Deviations of Indicators for 2-Profile Solution Non-Suicidal Behavior Solution

<b>Profile</b>	<b>BPD</b>	<b>DIRI</b>	<b>COPE</b>	<b>EDI</b>
	<i>Mean (SD)</i>	<i>Mean (SD)</i>	<i>Mean (SD)</i>	<i>Mean (SD)</i>
Profile-1	11.01(.35)	10.02(.61)	10.02(.51)	13.30(.60)
<u>Profile-2</u>	<u>19.56(.53)<sup>a</sup></u>	<u>16.35(.88)<sup>a</sup></u>	<u>12.09(.75)<sup>a</sup></u>	<u>17.10(1.17)<sup>a</sup></u>
<u>Sample</u>	<u>14.38(4.93)</u>	<u>12.51(5.77)</u>	<u>10.84(4.60)</u>	<u>14.79(6.43)</u>

Note: Sample N = 128, Profile-1 N=78, Profile-2 N=50; BPD = borderline personality disorder symptoms, DIRI= excessive reassurance seeking, COPE= drinking to cope, EDI = Eating Disorder Inventory- Bulimia subscale; a=significantly greater than Profile-1 at p<.001

Figure 1

Clinical Characteristics of Latent Profiles



Note: N=128. BPD = symptoms of borderline personality disorder, DIRI = excessive reassurance seeking, COPE = drinking to cope with negative affect, EDI = dysregulated eating behaviors, NSSI = non-suicidal self-injury, BSS = suicidal ideation.