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Psychiatric Heterogeneity of Recent Suicide Attempters: A Latent Class Analysis

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Abstract

Presence of, and comorbidity between, psychiatric disorders is a risk factor for suicide attempts. No study to date has used a person-centered approach to determine whether there are subgroups of attempters showing differing patterns of psychiatric disorders. This study aimed to identify psychiatric subgroups amongst recent suicide attempters (i.e., hospitalized within 24 hours of their attempt) and to determine whether identified classes could be differentiated in terms of important clinical correlates. Participants included 97 adult patients who were hospitalized due to a recent suicide attempt at a large Trauma 1 hospital. A structured diagnostic interview assessed a range of psychiatric disorders, and a battery of measures assessed acute and distal clinical correlates and characteristics of the current attempt. The person-centered analytic approach of latent class analysis was used to identify psychiatric diagnostic subgroups, or classes, of attempters. Three psychiatric subgroups were identified: Major Depressive Disorder, High Externalizing Disorders, and High Internalizing High Externalizing Disorders. Classes were found to significantly differ on a range of acute and distal clinical correlates, but not by demographics. Identification of psychiatric subgroups of individuals who have recently attempted suicide has important practical implications for increasing subsequent treatment utilization and tailoring treatment interventions for this population.

Keywords

suicide: suicide attempt; psychiatric diagnosis

1. Introduction

Suicide is a leading cause of death in Western countries (World Health Organization [WHO], 2000), and the second leading cause of death from injury broadly (Haagsma et al., 2016). Within the United States, for each one person who dies by suicide, there will be another 22

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Conflict of interest

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individuals who require emergency medical care for suicidal behavior (Vastag, 2001). This translates to a significant public health influence, as approximately 4.6% of the US population will make an attempt within their lifetime (Kessler et al., 1999). Prior suicide attempt has been identified as one of the best predictors of eventual death by suicide (Goldstein et al., 1991), making understanding correlates of suicide attempt a high priority research target. Additionally, the subsequent discharge period following an attempt has been identified as a pivotal time where recent attempters have a heightened risk for subsequent suicide (Goldacre et al., 1993). Understanding individual characteristics of suicide attempters is an important way to inform prevention within psychiatric samples and as well as post-attempt intervention efforts.

A psychiatric disorder diagnosis is widely identified as a risk factor for suicide attempt, and treatment of psychiatric disorders is a common intervention aimed at suicide risk reduction (Mann et al., 2005). The current study aims to advance our understanding of heterogeneity of psychiatric diagnoses within suicide attempter samples by specifically identifying subgroups differentiated by patterns of lifetime psychiatric diagnoses present prior to a suicide attempt. Studies find that a psychiatric disorder diagnosis is reported for nearly 80% of suicide attempters in the United States (Nock et al., 2010), and medically serious suicide attempters (89%) have significantly higher rates of having any psychiatric disorder than randomly selected community controls (31%; Beautrais et al., 1996a). In an extensive review of the literature on suicidal behavior in young people, Beautrais and colleagues (1996b) found that the most commonly identified categories of psychiatric disorders identified within this population were internalizing disorders, specifically mood and anxiety disorders, and externalizing disorders, including substance use disorders and antisocial behaviors.

Individual disorders within the broad internalizing disorder classification have a marked correspondence with suicide attempt. For example, in a nationally representative sample of US adults, over 53% of attempters were identified as meeting diagnostic criteria for a major depressive disorder, 15% for generalized anxiety disorder, and nearly 12% for panic disorder (Nock and Kessler, 2006). These individual disorders are also associated with increased odds of having a lifetime suicide attempt (e.g., Kessler et al., 1999). Specific individual disorders within the broad classification of externalizing disorders also correspond with suicide attempts. Data from the National Comorbidity survey (Nock and Kessler, 2006) shows that rates of antisocial personality disorder (21%) and substance use disorders, such as alcohol abuse (43%), alcohol dependence (35%), drug abuse (33%), and drug dependence (23%), were common amongst suicide attempters. All five of these disorders have been found to occur at higher rates for suicide attempters than non-attempters within US nationally representative samples (e.g., Kessler et al., 1999).

Although individual internalizing and externalizing disorders occur at high rates within suicide attempter samples (e.g. Nock and Kessler, 2006), differentiate attempters from community controls (e.g. Beautrais et al., 1996a), and significantly correspond with risk for future attempt (e.g. Nock et al., 2010), it is also important to consider possible implications of diagnostic comorbidity. Suicide attempters are significantly more likely to have more than one psychiatric diagnosis, with 13% of attempters meeting criteria for any one psychiatric disorder, 12% of attempters meeting criteria for any 2 psychiatric disorders, and over 60% of

attempters meeting criteria for 3 or more psychiatric disorders (Nock and Kessler, 2006). Further, some research finds that having only two psychiatric disorders increases risk for a suicide attempt (Nock et al., 2010), while other research suggests a dose-response effect between the number of prior psychiatric disorders and increased odds for suicide attempt (Kessler et al., 1999). Specific patterns of comorbidity, including having an internalizing disorder (i.e. depression) plus an externalizing disorder (i.e. substance use disorder) (e.g., Dhossche et al., 2000), having multiple internalizing disorders (i.e., anxiety and depression) (e.g., Pawlak et al., 1999), and having multiple comorbid externalizing disorders (i.e., alcohol use disorder, substance use disorder, and antisocial behavior) (e.g. Verona et al., 2004) also are found at high rates within suicide attempter samples and/or to significantly increase risk for suicide attempt.

Overall, this body of research shows a high prevalence of psychiatric disorders and psychiatric disorder comorbidity within suicide attempter samples compared to controls. However, these are overall estimates, using traditional variable-centered approaches. Notably, there may be psychiatric heterogeneity within suicide attempter samples, such that the rate of an individual psychiatric disorder and its comorbidity with other disorders may *vary* across different subgroups of attempters. While patterns of comorbidity of suicide attempters has been examined using both psychiatric and general population samples (e.g., Blasco-Fontecilla et al., 2016 for a review; Kessler et al., 1999) to our knowledge, no study to date presents a person-centered examination to determine whether there are distinct subgroups of recent attempters showing differing patterns of prevalence of individual disorders and their comorbidities. For instance, it is possible that there is one subgroup of individuals who have a high prevalence across all psychiatric disorders, suggesting strong psychopathology and comorbidities, and/or a subgroup of suicide attempters who have high rates of certain disorders and not others.

In the current study, we use the person-centered approach of latent class analysis (LCA; Muthén and Muthén, 1998–2012), to characterize patterns of multiple psychiatric comorbidities, representing both internalizing disorders (including major depressive disorder, generalized anxiety disorder, and panic disorder) and externalizing disorders (including alcohol use disorder, non-alcohol substance use disorder, and antisocial personality disorder), among a sample of recently hospitalized suicide attempters. Further, we determine whether identified psychiatric classes could be differentiated in terms of important clinical correlates. Suicide attempt characteristics (e.g., violence of method), and acute (e.g., use of substances prior to the attempt) and distal (e.g., trait disinhibition) clinical correlates were selected based on their relations to aspects of published suicide risk assessments, acute warning signs for suicidal behavior, and important characteristics of suicidal acts (e.g. Bagge et al., 2013a; Brown et al., 2000; Cochrane et al., 2008; Conner et al., 2004; Joiner, 2005; Joiner et al., 2005; Malone et al., 2000; Nock et al., 2010; Rosellini and Bagge, 2014; Runeson et al., 2010; Sargalska et al., 2011; Suominen et al., 2004; Yen et al., 2009).

2. Method

2.1. Participants and Procedures

The current study is part of a larger ongoing study designed to examine relations between impulsivity and suicide attempts. The current sample included 97 adults who were hospitalized due to a recent suicide attempt (i.e., within 24 hours of their attempt) with at least some intent to die (Silverman et al., 2007). The average age of participants was 32.71 ($SD = 11.82$; range = 18 to 57) and 60% were female ($n = 58$). Participants identified as the following races: 63% ($n = 61$) Caucasian, 32% ($n = 31$) African American, 2% ($n = 2$) Native American, Alaskan Native, and 3% ($n = 3$) multiracial. Overall, 7% of the sample ($n = 7$) used a violent suicide attempt method (e.g., index attempt by either gun, hanging, drowning, jumping from heights and/or immolation; Bagge et al., in press) and 66% of the sample ($n = 64$) reported at least one prior attempt (i.e., prior to the index attempt that led to their hospitalization).

The Institutional Review Board of the participating university hospital reviewed and approved the protocol. Participants were recruited from an inpatient psychiatric unit at a Level 1 trauma hospital. All participants were provided written informed consent and informed they were free to discontinue participation at any time. Each participant completed the 5-hour study session in a private room during their hospital stay and was paid \$70 for completing the assessment session.

2.2. Measures

2.2.1. Measurement of Lifetime Psychiatric Diagnoses—The Computerized Diagnostic Interview Schedule (C-DIS), a valid and reliable computerized version (e.g., Blouin et al., 1988; Vandiver and Sher, 1991) of the Diagnostic Interview Schedule (Blouin, 1991; Robins et al., 2000), was used to determine the presence (1=present; 0=absent) of lifetime DSM-IV (American Psychiatric Association, 1994) diagnoses which included the following: alcohol use disorder (AUD; any alcohol abuse or dependence), substance use disorder (SUD; any non-alcohol substance abuse or dependence, with the exclusion of tobacco use), major depressive disorder (MDD), panic disorder (PD), and generalized anxiety disorder (GAD). The Antisocial Personality Disorder Module of the Structured Interview for DSM-IV Personality (SIDP-IV; Pfohl et al., 1997), a valid and reliable interview (e.g., Zimmerman, 1994), was used to determine whether participants met criteria for antisocial personality disorder (1=present; 0=absent) within the last 2 years.

2.2.2. Measurement of Suicide Characteristics—The severity of an individual's wish to die by a suicide attempt was measured with the Scale of Suicidal Intent Scale (SIS; Beck et al., 1974), a reliable and valid interview schedule (Beck et al., 1974; Brown, 2001; Mieczowski et al., 1993; Kaslow et al., 2006). The total score was used to assess overall *suicide intent*. Item 15 (suicide premeditation) was used to assess proximal suicide contemplation. Consistent with previous studies (e.g., Bagge et al., 2013a) this item was dichotomized to indicate *short proximal contemplation* (contemplation for less than 3 hours=1 and contemplation for 3 hours or more=0).

To assess any history of attempts prior to the current hospitalization a single question from the Self-Injurious Thoughts and Behaviors Interview (SITBI; Nock et al., 2007), “how many suicide attempts have you made in your lifetime?” was administered. Notably, a suicide attempt was defined for participants as “an actual attempt to kill yourself in which you had at least some intent die” prior to asking participants about their prior suicide attempts.

History of previous attempts was coded (1) if the participant indicated that they made 2 or more attempts in their lifetime and was coded (0) if they indicated that this was their only attempt (see Bagge et al., 2013a; Ward-Ciesielski et al., 2016). Finally, a single item from the structured WHO-Composite International Diagnostic Interview CIDI 3.0 (Kessler and Üstün, 2004) was used to assess the method for the current suicide attempt. Participants were asked, “What method(s) did you use?” (Kessler and Üstün, 2004). Suicide attempt by either gun, hanging, drowning, jumping from heights and/or immolation was considered a violent suicide attempt method (Bagge et al., in press). *Violent method* was coded as a dichotomous variable (1=at least one violent method used; 0=no violent method used).

2.2.3. Measurement of Distal Clinical Correlates—Participants completed a battery of self-report measures to determine the associations between classes and a range of distal clinical correlates. Total scores of empirically-validated measures were used including *hopelessness* about the future (Beck Hopelessness Scale [BHS], Beck and Steer, 1988) *depressive symptoms* (Beck Depression Inventory II [BDI-II], Beck et al., 1996, with item #9 on suicidal ideation excluded to avoid criteria contamination, see Bagge et al., 2014a; Ward-Ciesielski et al., 2016), *intolerance of uncertainty* (Intolerance of Uncertainty Scale [IUS], Freeston et al., 1994; in English, Buhr and Dugas, 2002), three broad-based dimensions of personality: *positive temperament*, *negative temperament*, and *disinhibition* (The General Temperament Survey [GTS], Clark and Watson, 1990; Clark and Watson, 1999), two dimensions of the interpersonal-psychological theory of suicide, *thwarted belongingness* and perceived sense of *burdensomeness* (Interpersonal Needs Questionnaire [INQ-12], Van Orden et al., 2008) and *reasons for living*, potential reasons for *not* committing suicide (Reasons for Living Inventory [RFL], Linehan et al., 1983). Frequency of *past year binge drinking* behavior (i.e. five or more standard drinks for males or four or more standard drinks for females) was assessed by the National Institute of Alcohol Abuse and Alcoholism’s (NIAAA) recommended item (NIAAA, 2003) and included the following response options: 0=none, 1=1–2×/year; 2=3–11×/year; 3=1×/month; 4=2–3×/month; 5=1×/week; 6=2×/week; 7=3–4×/week; 8=5–6×/week; 9=every day. Finally, participants answered one additional question from the WHO-CIDI; “In your lifetime, not counting the times you were an overnight patient in the hospital, did you have one or more sessions of psychology counseling or therapy for emotional problems that lasted 30 minutes or longer with any type of professional?” This question included a memory prompt of a list of types of professionals they may have seen for counseling or therapy. Lifetime *previous therapy* was rated as present (1) or absent (0).

2.2.4. Measuring Acute Clinical Correlates—Acute substance use prior to an attempt has been defined as any use within the 24 hours before the attempt (see Bagge et al., 2013a; Bagge et al., 2014b). For the current study, to assess whether any alcohol or illicit drugs were used acutely before the suicide attempt, participants were asked, “Did you drink

alcohol within the 24 hours prior to your attempt?” and “Did you use illegal drugs (e.g., marijuana, cocaine, amphetamines, heroin, psychedelics) within the 24 hours prior to your attempt?” Participants were instructed that acute use of substances did not include any alcohol or illicit drugs that may have been used as part of the suicide method. Any *acute alcohol and drug use* were dichotomously coded variables (1=present or 0=absent).

3. Analytic Approach

A latent class analysis (LCA) was used to identify groups of suicide attempters with similar diagnostic profiles. LCA is a subtype of latent variable mixture modeling, a flexible, person-centered analytic procedure. LCA characterizes individuals based on probabilistic models of class membership, which is more consistent with reality. Rather than having investigators decide how to combine diagnoses (with a set of seven diagnoses there are a possible 128 number of combinations), algorithms systematically group individuals that have similar patterns of psychiatric heterogeneity. LCA differs from variable-centered analyses in that it can identify clusters of participants within a sample who share similar response patterns on variables of interest (Berlin et al., 2014; Muthén, 1998). The latent class model was extracted from discrete, binary, observed variables of lifetime psychiatric diagnoses. Groups of suicide attempters with similar patterns of diagnoses gained membership into specific, discrete latent classes.

The LCA procedure was conducted using Mplus, Version 7 (Muthén and Muthén, 1998). To address possible issues of local maximum, for all models 100 random sets of starting values were generated during the initial stage of model extraction after which point 10 optimizations were carried out. Model solutions were compared and evaluated based on a series of fit statistics including: the Bayesian information criterion (BIC) and the sample-size adjusted BIC where lower BIC indicates better model fit, the Akaike information criterion (AIC) where lower AIC is associated with better model fit, and the Lo-Mendell-Rubin (LMR) likelihood ratio test, a bootstrapping based test which can be used to compare improvement between models with different numbers of classes (a non-significant p -value suggests that the model with one fewer class provides a more parsimonious fit to the data). Finally, entropy, a statistic indicating classification accuracy, or how well participants are assigned to their most likely class, was considered. Entropy ranges from 0 to 1 with scores closer to one indicating greater classification accuracy. We examined one to four class solutions. Upon selection of the best-fit model, a series of multinomial logistic regressions were then conducted to better understand the univariate relations between a number of specific suicide characteristics and risk factors with class membership (as recommended by Huberty and Morris, 1989). Given the exploratory nature of this study, our limited sample size, and the importance of protecting against type 2 errors in this initial study, no experiment-wise corrections were made.

Notably, missing psychiatric diagnostic data occurred at a low frequency (i.e., 9 participants did not have full psychiatric diagnostic data). Full information maximum likelihood estimation was used to handle missing data for the latent class analyses. The extent of missing data for clinical correlates was minimal (e.g., 5 of the 97 participants had missing values on intolerance of uncertainty and the GTS temperament scales, which represented the

variables with the most missing values). Pairwise deletion was used for analyses involving clinical correlates (e.g., Downey and King, 1998).

Results

4.1. Extraction of Latent Classes

Indicators of the LCA were lifetime diagnosis of an alcohol use disorder, substance use disorder, antisocial personality disorder, major depressive disorder, panic disorder, and generalized anxiety disorder. While the BIC indicated the two-class model as the best fit, the best-fitting model indicated by the AIC, the adjusted BIC, and LMR was the three-class model (See Table 1 for details). Additionally, the entropy value for the three-class model was quite high (0.90) indicating high precision for class membership assignment for this model, whereas the entropy for the two-class model was only 0.60. Thus, the three-class model was selected as the best-fit model to the data.

4.2. Comparisons of Diagnostic Classes

Following the identification of the three classes, individual participants were assigned to their most likely class (See Figure 1). Nearly half the participants in the sample (47%, $n = 46$) belonged to Class 2, labeled “Major Depressive Disorder Class.” Individuals in this class had lower rates of lifetime psychiatric diagnoses than those individuals in the other two classes, but a large percentage of them did have a lifetime major depressive disorder diagnosis. Attempters in Class 1 (27%, $n = 26$), labeled as “High Internalizing Disorders and High Externalizing Disorders Class,” had high rates of lifetime major depressive disorder and all attempters in this class had a lifetime history of panic disorder and generalized anxiety disorder. Additionally, attempters in this class also had high rates of lifetime alcohol use disorder. The attempters in Class 3, the “High Externalizing Disorders Class” (26%, $n = 25$) had a high rate of alcohol use disorder and 100% of participants in this class had a lifetime (non-alcohol) substance use disorder. Additionally, attempters in this class had a high rate of antisocial personality disorder.

4.3. Clinical correlates by class

Descriptive information for clinical correlates, including suicide characteristics, distal clinical correlates, and acute clinical correlates are described by class in Table 2. To better understand the relations between suicide characteristics and class membership, a series of multinomial logistic regressions were conducted whereby classes served as the dependent variable. Notably, potential demographic covariates of gender, age, and race were found to not significantly differ by class. Due to small overall sample size, and consistent with previous research (Bagge et al., in press), the largest class (Class 2, the ‘Major Depressive Disorder Class’) was set as the reference group to increase power to detect meaningful effects between individuals in the most common diagnostic subgroup and the two smaller subgroups of interest. Results from these analyses can be found in Table 3.

4.3.1. Suicide Characteristics—History of a previous suicide attempt, overall suicide intent, and violence of suicide method for their current attempt, was not associated with membership in Classes 1 and 3. However, having short proximal contemplation, ($OR=0.24$;

95% CI=0.06–0.91) was significantly associated with having lower odds of being a member of Class 1 than the reference. This variable was not associated with Class 3 membership.

4.3.2. Distal Clinical Correlates—Thwarted belongingness was not associated with membership in Classes 1 and 3. A greater level of overall psychological distress (i.e., greater levels of hopelessness [OR=1.13; 95% CI=1.02–1.26], current depressive symptoms [OR=1.06; 95% CI=1.01–1.11], perceived burdensomeness [OR=1.06; 95% CI=1.01–1.11], greater intolerance of uncertainty [OR = 1.03; 95% CI = 1.03 – 1.06], and negative temperament [OR=1.17; 95% CI=1.03–1.33]) was associated with higher odds of being in Class 1 than the reference class. These indicators of overall psychological distress were not found to significantly associate with membership in Class 3. Lower levels of positive temperament (OR=0.93; 95% CI=0.86–1.00) and history of previous outpatient therapy (OR=4.39; 95% CI=1.41–13.69) were also only associated with greater odds of being in Class 1 than the reference class and were not found to be significantly associated with Class 3.

There were also several clinical correlates that were significantly associated with membership in Class 3 but not Class 2. Greater levels of past year binge drinking (OR=1.21; 95% CI=1.01–1.45) and disinhibition (OR=1.11; 95% CI=1.03–1.20) were found to be only associated with being in Class 3 compared to the reference class. Interestingly, lower levels for reasons for living were associated with both Class 1 (OR=0.58; 95% CI=0.37–0.92) and Class 3 (OR=0.58; 95% CI=0.37–0.97) membership when compared to the reference class.

4.3.3. Acute Clinical Correlates—Drinking alcohol within the 24 hours prior to the current suicide attempt was associated with membership in Classes 1 (OR=2.83; 95% CI=1.03–7.80) and 3 (OR=4.25; 95% CI=1.51–11.98) compared to the reference. Additionally, using an illegal drug in the 24 hours prior to the current suicide attempt was only associated with membership in Class 3 (OR=4.44; 95% CI=1.38–14.37).

5. Discussion

In a sample of recent suicide attempters hospitalized at a large Level 1 Trauma hospital, the present study's aims were to 1) utilize the person-centered analytic approach of latent class analysis to identify psychiatric diagnostic subgroups, or classes, of attempters, and to 2) determine whether identified classes could be differentiated in terms of important clinical correlates. Our findings demonstrated that there is meaningful psychiatric heterogeneity among attempters such that the presence of psychiatric disorders *varied* across different subgroups of attempters, and classes were found to significantly differ on a range of important acute and distal clinical correlates.

The LCA model identified a three-class solution as the best fit to the data with the most precise subgroup assignment for participants in the sample. Participants clustered into groups typified by internalizing diagnoses (Class 2) and externalizing diagnoses (Class 3), while a third subgroup (Class 1) was characterized by attempters whose psychiatric diagnostic profiles were typified by disorders representative of both the internalizing and externalizing disorder categories. Each of the three discrete classes also showed differential

correspondence across a range of distal and acute clinical correlates. Notably, demographics were consistent across class and the current suicide characteristics for each subgroup of attempters were largely consistent. Specifically, classes did not differ in suicide intent, violence of method, or history of previous attempt, showing all subgroups had the same level of severity of these characteristics.

Class 1, the High Internalizing Disorder and High Externalizing Disorder Class, captured a subgroup of attempters reporting high levels of distress as measured by a number of clinical correlates including hopelessness, depression, perceived burdensomeness, few reasons for living, heightened intolerance of uncertainty, and negative temperament. Only 13% of Class 1 attempters had short proximal suicide contemplation, showing that this class was characterized by longer periods of proximal thoughts of killing oneself. Additionally, while individuals in this class only reported binge drinking less than once a month during the past year, they did have high rates of lifetime alcohol use disorder and endorsed acute alcohol use in the 24 hours prior to the current attempt. Importantly, diagnosis of an alcohol use disorder is not dependent on the frequency of use but on the problems that arise from use. Thus, this pattern suggests that while Class 1 attempters may not have the highest frequency of binge drinking across classes, they are experiencing problematic consequences related to their drinking. Of particular concern, many used alcohol directly preceding a critical problematic behavior, their current suicide attempt. Alcohol may have been used to cope with the significant distress typifying this subgroup. Tailored treatment recommendations for this Class include a focus on decreasing internalizing symptoms of distress and alcohol-related consequences, for example, by examining the function of drinking (e.g., to cope) and providing the patient with more adaptive means to serve that function.

Further, the Interpersonal Theory of Suicidal Behavior (Van Orden et al., 2010) posits that thwarted belongingness and perceived burdensomeness, combined with hopelessness, can increase risk for suicidal desire. Perceptions of burdensomeness alone have also been conceptualized as having a key influence on suicide risk (Sabbath, 1969). Dimensions key to the Interpersonal Theory of Suicidal Behavior, burdensomeness and hopelessness, were particularly salient clinical correlates for this subgroup of attempters. Thus, directly targeting perceptions of perceived burdensomeness and hopelessness via cognitive therapy (Joiner and Van Orden, 2008; Van Orden et al., 2010) would be potential targets during the hospital stay or integrated into post-discharge treatment planning.

Attempters in Class 3 had high rates of comorbid externalizing disorders. Clinical correlates of this group showed a high rate of disinhibition and considerable involvement with substance use (including high rates of past year binge drinking, and acute use of drugs and alcohol within the 24 hours prior to their current attempt). Acute use of alcohol has been shown to be a warning sign for suicide attempts (Bagge et al., 2013b) and both substance use disorder and alcohol use disorder have been repeatedly shown to significantly increase risk for suicide attempt and death by suicide (see Conner et al., 2014 for review). Attempters within Class 3 will likely benefit from interventions specifically targeting their substance use disorder. However, treatment targeting a substance use disorder alone is likely not sufficient to reduce suicide risk due to the relapsing nature of this category of psychiatric illness (Conner et al., 2014). Given the difficulties with impulsivity common in substance use

disorder populations, and characterized by Class 3, comprehensive treatments that target not only motivation to change use and promote relapse prevention but also supplement with dialectical behavior therapy skills (DBT; Linehan, 1993) to decrease impulsivity and problematic behaviors are recommended as important adjunctive components of treatment for this group (Conner et al., 2014). DBT has previously been used to reduce suicide attempts among those with problematic substance use (Dimeff and Linehan, 2008).

The largest class, Class 2, consisted primarily of attempters with the internalizing disorder of major depression. Attempters in this subgroup are typified by depression by reporting current depressive symptoms in the severe range (as measured by the BDI-II). Surprisingly, these attempters had scores on the BDI-II that were significantly lower than Class 1 attempters. They also had more reasons for living than either of the other classes. Notably, Class 2 attempters are the only subgroup with a reason for living score above the measure's recommended clinical cutoff (below 3.8), a score found to have good sensitivity and specificity for detecting suicide attempters from psychiatric controls (Osman et al., 1999). Compared to the highly distressed attempters in Class 1, who also were characterized by major depressive disorder, Class 2 attempters reported significantly higher rates of short proximal suicide contemplation, indicating that in the week prior to the attempt, Class 2 attempters more often first thought about suicide within 3 hours of their attempt.

The clinical profile of Class 2 makes this a challenging subgroup to uniquely identify simply by psychiatric diagnosis profile or risk profile, further highlighting the need for ongoing monitoring and comprehensive screening of *changes* in suicide risk (e.g., Osman et al., 1999). Class 2's high reasons for living (compared to both classes), higher short proximal suicide contemplation and lower distress (compared to Class 1), and lower externalizing behaviors (compared to Class 3) suggest that there are potentially other clinical correlates that better define this class and are not captured by the current study's measures.

A potential conjecture is that Class 2 may be characterized by within-person changes in unmeasured acute events/behaviors that have been shown to be warning signs for suicide attempts (e.g., having an acute negative interpersonal life event). Notably, a previous study (Bagge et al., 2013c) found that that an acute interpersonal negative life event was a within-person warning sign for suicide attempts (was more common on the day of a suicide attempt than the day before [when there was no attempt]), but only among those who had short suicide premeditation. Thus, an acute interpersonal negative life event may differentiate Class 2 from Class 1, given that class 2 was characterized by having short proximal suicide premeditation.

Next, the current study found that Class 2 had lower rates of acute alcohol use on the day of the attempt compared to the remaining classes. However, use of alcohol was not measured on the day before the attempt (a within-subject control period where the patient did not attempt suicide). Thus, it is possible that within-person *changes* in alcohol use over this period (Bagge et al., 2013b) could typify Class 2. Future research is needed that can examine classes based on psychiatric diagnosis with a range of clinical covariates that represent acute changes (not merely presence on the day of the attempt) to better inform prevention and treatment efforts.

Overall, our findings emphasize the importance of using distress safety plan interventions (Bagge et al., 2013a) not only for those individuals who are currently thinking about suicide but also those in current distress (see Bagge et al., 2013a; Bagge et al., 2014b). A distress safety plan (Bagge et al., 2013a; Bagge et al., 2014b) incorporates similar information to what is found in a suicide safety plan (e.g., Stanley and Brown, 2012) including identification of warning signs, coping strategies, external support/resources, and instructions for securing a safe environment. Distress is a core symptom of all psychiatric disorders. The universal applicability of distress safety plans for individuals' experiencing any psychiatric complaint ensures all patients will have a specific plan for what to do if there distress increases or if a suicidal crisis emerges. Further, prior to discharge, providers may consider using behavioral chain analysis (Linehan, 1993) to identify novel acute factors, such as the emergence of a negative life event, in order to further identify unique treatment targets for a particular patient and to inform tailored distress safety plans for this subgroup.

Although our findings enhance preliminary understanding of psychiatric subgroups of suicide attempters and their clinical correlates, this study is not without limitations. Our small sample size necessitated that we limit the number of indicators used in our latent class analysis to allow for model convergence (as recommended by Wurpts and Geiser, 2014). Further, the diagnostic class profiles are themselves limited in that they are only able to capture dichotomous lifetime diagnoses of a restricted set of psychiatric conditions. A focus on lifetime diagnoses may have led to some classes capturing diagnoses for participants that were no longer actively experiencing clinically significant symptoms. We do have increased confidence of applicability of lifetime diagnoses due to the concurrent correspondence of certain diagnoses with current distal and clinical correlates (e.g., those with lifetime substance use disorders also had the highest rates of substance use within 24 hours of their current attempt). Notably, given the exploratory nature of our study, its small sample size, and the importance of protecting against type 2 errors in this initial study, we conducted a large number of univariate analyses when comparing classes. Thus it is possible that some observed class differences were due to chance. Future studies using larger samples should include additional psychiatric disorders which capture the complexity of profiles to obtain more comprehensive class models, and also use multivariate statistical models of clinical correlates.

Additionally, our sample included medically-attended suicide attempters, and thus it is unknown how our results may generalize to individuals who did not seek medical attention after their suicide attempt or to those who have died by suicide. A psychological autopsy interview (e.g., Bakst et al., 2016) may be a useful alternative for studying subgroups of attempters who do not present to medical services. Finally, the study design was not prospective and relied on retrospective assessment of psychiatric disorders and external correlates. Thus, causality cannot be determined. Utilization of longitudinal designs will be an important next step to determine how these three diagnostic subgroups may predict risk for future attempt and inform tailored treatment recommendations.

This study is a preliminary step to identify psychiatric subgroups of recent suicide attempters and their clinical correlates. Future research is needed to determine if tailored

treatment interventions for attempters based on class membership can be used to inform efforts to reduce risk of future attempts and death by suicide.

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Highlights

- Three psychiatric subgroups of recent suicide attempters were identified.
- Classes differed on acute and distal clinical correlates, but not demographics.
- Results have practical implications for tailored treatment recommendations.

Figure 1. Probability of lifetime diagnosis by latent class. Note: All diagnoses are lifetime. Alcohol Use Disorder (AUD), Substance Use Disorder (SUD), Antisocial Personality Disorder (Antisocial), Major Depressive Disorder (MDD), Panic Disorder (Panic), and Generalized Anxiety Disorder (GAD)

Table 1

Latent class model fit information

Fit statistics	1 Class	2 Class	3 Class	4 Class
AIC	767.27	747.16	740.27	746.01
BIC	782.71	780.63	791.77	815.86
Adjusted BIC	763.77	739.58	728.61	731.73
LMR, p-value	N/A	0.40	<0.01	0.65
Entropy	N/A	0.60	0.90	0.84

Note: Model solutions were compared and evaluated based on a series of fit statistics including: the Bayesian information criterion (BIC), the sample-size adjusted Bayesian information criterion (Adjusted BIC), the Akaike information criterion (AIC) the Lo-Mendell-Rubin (LMR) likelihood ratio test, and entropy.

Table 2

Means (standard deviations) and frequency of clinical correlates by diagnostic class.

Variable	Class 1: Mixed Int/Ext	Class 2: MDD	Class 3: High Ext
Suicide Characteristics			
Suicide intent	14.25 (4.86)	12.60 (4.87)	13.38 (3.88)
Short proximal contemplation	12.50%	37.78%	37.5%
History of previous attempt	76.92%	58.70%	68%
Violent attempt method	4.00%	6.82%	12.00%
Distal Clinical Correlates			
Beck Hopelessness	16.35 (4.26)	12.98 (6.01)	14.29 (6.18)
Beck Depression	41.62 (9.10)	33.64 (11.46)	31.76 (17.04)
Past year binge drinking	2.12 (2.79)	3.76 (3.60)	6.72 (3.41)
Intolerance of uncertainty	95.75 (20.02)	80.11 (22.08)	80.63 (27.78)
Negative Temperament	24.00 (3.65)	20.66 (5.59)	21.42 (5.45)
Positive Temperament	12.04 (7.97)	15.61 (6.60)	16.38 (6.38)
Disinhibition	15.04 (7.40)	11.64 (6.09)	16.42 (7.62)
Burdensomeness	34.76 (8.63)	27.71 (10.97)	30.32 (13.61)
Belongingness	23.04 (6.11)	20.60 (6.71)	22.80 (8.11)
Previous therapy	80.77%	48.89%	60.87%
Reasons for Living	3.39 (1.28)	4.09 (1.09)	3.38 (1.12)
Acute Clinical Correlates			
Alcohol use w/in 24 hours of attempt	50.00%	26.09%	60.00%
Illegal drug use w/in 24 hours of attempt	15.38%	13.04%	40.00%

Note: Data is presented as means (*SD*) for the numerical variables and *n* (%) of the categorical variables Mixed Int/Ext = High Internalizing Disorders and High Externalizing Disorders (*n* = 26); MDD = Major Depressive Disorder (*n* = 46); High Ext = High Externalizing Disorders (*n* = 25). Clinical correlate *n*'s range from 92–97 due to pairwise deletion.

Table 3

Estimates from univariate multinomial logistic models predicting diagnostic class.

Variable	Class 1 vs. Class 2 Odds ratio (95% CI)	Class 3 vs. Class 2 Odds ratio (95% CI)
Suicide Characteristics		
Suicide intent	1.08 (0.97, 1.21)	1.04 (0.93, 1.16)
Short proximal contemplation	0.24 * (0.06, 0.91)	0.99 (0.36, 2.75)
History of previous attempt	2.35 (0.79, 6.94)	1.50 (0.54, 4.17)
Violent attempt method	0.57 (0.06, 5.79)	1.86 (0.35, 10.02)
Distal Clinical Correlates		
Beck Hopelessness	1.13 * (1.02, 1.26)	1.04 (0.95, 1.13)
Beck Depression	1.06 * (1.01, 1.11)	0.99 (0.95, 1.03)
Past year binge drinking	1.09 (0.90, 1.32)	1.21 * (1.01, 1.45)
Intolerance of uncertainty	1.03 * (1.01, 1.06)	1.01 (0.98, 1.02)
Negative Temperament	1.17 * (1.03, 1.33)	1.03 (0.94, 1.13)
Positive Temperament	0.93 * (0.86, 0.99)	1.02 (0.94, 1.10)
Disinhibition	1.08 (0.99, 1.16)	1.11 * (1.03, 1.20)
Burdensomeness	1.06 * (1.01, 1.11)	1.02 (0.98, 1.07)
Belongingness	1.05 (0.98, 1.13)	1.05 (0.98, 1.13)
Previous therapy	4.39 * (1.41, 13.69)	1.63 (0.59, 4.52)
Reasons for Living	0.58 * (0.37, 0.92)	0.58 * (0.37, 0.91)
Acute Clinical Correlates		
Alcohol use w/in 24 hours of attempt	2.83 * (1.03, 7.80)	4.25 * (1.51, 11.98)
Illegal drug use w/in 24 hours of attempt	1.21 (0.31, 4.76)	4.44 * (1.38, 14.37)

Note:

* = $p < 0.05$. Class 1 = High Internalizing and High Externalizing Disorders ($n = 26$); Class 2 = Major Depressive Disorder ($n = 46$); Class 3 = High Externalizing Disorders ($n = 25$). Clinical correlate n 's range from 92–97 due to pairwise deletion.