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Personality Disorder Risk Factors for Suicide Attempts over 10 Years of Follow-up

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Abstract

Objective—Identifying personality disorder (PD) risk factors for suicide attempts is an important consideration for research and clinical care alike. However, most prior research has focused on single PDs or categorical PD diagnoses without considering unique influences of different PDs, or severity (sum) of PD criteria on the risk for suicide related outcomes. This has usually been done in cross-sectional or retrospective assessment methods. Rarely are dimensional models of PDs examined in longitudinal, naturalistic prospective designs. In addition, it is important to consider divergent risk factors in predicting the risk of ever making a suicide attempt versus making an increasing number of attempts within the same model.

Method—This study examined 431 participants who were followed for 10 years in the Collaborative Longitudinal Personality Disorders Study (CLPS). Baseline assessments of personality disorder criteria were summed as dimensional counts of personality pathology and examined as predictors of suicide attempts reported at annual interviews throughout the ten-year follow-up. We employed univariate and multivariate zero-inflated Poisson regression models to simultaneously evaluate PD risk factors for ‘ever attempt’ and for increasing numbers of attempts among attempters.

Results—Consistent with prior research, borderline PD was uniquely associated with ever attempting. However, only narcissistic PD was uniquely associated with an increasing number of attempts.

Conclusion—These findings highlight the relevance of both borderline and narcissistic personality pathology as unique contributors to suicide related outcomes.

Keywords

suicide attempt; personality disorder; borderline; narcissistic; risk factors

Identifying diagnostic and personality characteristics that put individuals at increased risk for suicide-related outcomes is a target for clinicians and researchers alike. Personality disorders (PDs) are frequently diagnosed in patients presenting with suicide risk (Overholder, Stockmeier, Dilley, Freiheit, 2002) suggesting that personality pathology may reflect important individual differences in predicting suicide attempts. Yet research and risk assessment recommendations often disagree markedly on the extent to which different PDs present risk factors for suicide. Some of this controversy derives from methodological differences, in which (a) assessment is limited to one, or a subgroup, of possible PD diagnoses, (b) relies on retrospective or cross-sectional assessments, or (c) inconsistencies in quantitative analytic approaches. These discrepancies have made it difficult to draw firm conclusions about the associations of a given PD with suicide risk. In fact, the confusion and inconsistency mean clinicians may ignore some diagnoses in assessing suicide risk (Chioqueta & Stiles, 2004). Beyond this, a suicide attempt frequently provides the impetus for connecting an individual with clinical services, especially hospitalization. Understanding which PDs may raise the risk for increasing numbers of suicide attempts is an avenue important for suicide research that has implications for treatment planning and future risk assessment. Yet little research has examined which PD dimensions predict an increasing numbers of suicide attempts while controlling for the propensity for an initial attempt.

Research on suicide attempts and PDs has focused primarily on either borderline personality disorder (BPD) or Cluster B PDs (antisocial, borderline, histrionic, and narcissistic). NESARC data identified BPD as a top population-attributable risk factor for suicide attempts (Bolton & Robinson, 2010). To address the distinction between ever and recurrent attempts, Stringer, van Meijel, Eikelenboom and colleagues (2013) employed a negative binomial regression model to examine the effects of BPD on ever and recurrent attempts in depressed and anxious patients. BPD traits did predict ever and recurrent suicide attempts, however other PD traits were not assessed or included in the model. Analyses that did include other PDs, particularly cluster B PDs, may point to additional or unique associations between personality pathology and suicide related outcomes.

Cluster B PDs have been found to account for the bulk of suicide risk among individuals with significant personality pathology. In an examination of endophenotypes of personality and suicide risk (McGirr et al., 2009), researchers found that cluster B PD traits mediated the link between familial predisposition to suicide attempts and severity in family members. The researchers interpreted these findings as supporting the link between an impulsive aggression intermediate phenotype and suicide (McGirr et al, 2009). Impulsive aggression, the tendency to engage in interpersonal aggressive or hostile behavior (Bornoalova, Lejuez, Daughters, Rosenthal, & Lynch, 2005; Denson, Pedersen, Friese, Hahm, & Roberts, 2011), particularly fits the issues with aggressive behavior associated with antisocial PD (ASPD).

ASPD has been associated with suicide attempts (Links, Gould, & Ratnayake, 2003), particularly in female criminal offenders (Douglas et al, 2008; Kimonis et al, 2010). ASPD has also been identified as a risk factor for premature termination of dialectical behavior therapy, a treatment focused on reducing self-harming behaviors (Kroger, Roepke, & Kliem, 2014). Thus, individuals with ASPD diagnoses may be an increased risk for multiple suicide attempts over the course of their lifetime.

The hostile and explosive relation pattern of impulsive aggression also fits with the problematic interpersonal patterns characteristic of narcissistic PD (NPD; Horton & Sedikides, 2009; Ogrodniczuk, Piper, Joyce, Steinberg, Duggal, 2009; Roche, Pincus, Conroy, Hyde, & Ram, 2014). Supporting this idea, Pincus et al. (2009) found maladaptive narcissistic personality traits associated with suicide attempts in a small clinical sample. Similarly, a geriatric study reported greater endorsement of suicidal ideation among patients with NPD (Heisel, Links, Conn, van Reekum, & Flett, 2007). However, other research suggests associations of narcissistic PD with less impulsive but more lethal attempts (Blasco-Fontecilla et al., 2009). Importantly, only a few studies have examined all PDs in multivariate models. Thus, it is not clear to what extent individual Cluster B PDs may contribute to predicting suicide attempt risk beyond the variability associated with BPD criteria.

This issue is particularly salient when examining the existing PD and suicide research. Although some studies have reported risks associated with Cluster C PDs (dependent, avoidant, and obsessive-compulsive; Dervic, Grunebaum, Burke, Mann, & Oquendo, 2007; Diaconu & Turecki, 2009;), most research has failed to consider the extensive comorbidity of PD diagnoses (Becker et al., 2000) in examining suicide risk and/or consider the dimensionality or severity of PD criteria in predicting suicide risk. As an example, if a patient with a suicide attempt were to meet four diagnostic criteria for OCPD (threshold) but also meet four BPD criteria (sub-threshold), in a categorical analysis the predictive variance may be attributed to OCPD. However in a multivariate dimensional analysis, both sets of criteria may be considered simultaneously as predictive of suicide attempts. This type of analysis helps to clarify the weight that sub-threshold criteria may hold in predicting suicide risk. Therefore, it is important to understand the association of severity on a given PD dimension with suicide attempts relative to other PD dimensions, particularly risk already captured by BPD, in considering assessment and risk profiles.

This study used data from the Collaborative Longitudinal Personality Disorders Study (CLPS) to examine dimensional PD predictors of ever and multiple suicide attempts using zero-inflated count regression models, which can distinguish between predictors of ever attempting and multiple attempts. Prior publications from CLPS regarding suicide attempts have looked at PD diagnoses and BPD criteria as risk factors for any suicide attempt over two years of follow-up (Yen et al., 2003; Yen et al., 2004) and differences in traits and psychiatric disorders between single and multiple attempters (Boisseau, Yen, et al., 2013). However, no studies have examined dimensional symptom counts of the 10 DSM-IV PDs to prospectively predict suicide attempts over 10 years and none has used the zero-inflated count regression to distinguish risk factors for any attempt from those that might predict increasing numbers of multiple attempts.

Based on prior research findings, we hypothesized that cluster B PDs would be associated in univariate models with ever making an attempt (1 or more). We also hypothesized, given the focus in the literature on BPD and self-harm, that BPD would increment all other PDs in multivariate models predicting ever making an attempt. Given the dearth of research, particularly using this statistical approach, we had limited basis on which to make an *a priori* hypothesis on predicting an increasing number of suicide attempts. However, given theoretical understanding that ongoing self-harm is fundamental to the BPD construct and prior research which has predominantly focused on BPD as the primary personality pathology associated with suicide related outcomes, it seemed reasonable that BPD symptoms (without the self-harm criterion) would be associated with making an increasing number of suicide attempts in univariate and multivariate models. In addition, based on the associations with impulsive aggression, it was hypothesized that the other cluster B PDs, specifically narcissistic and antisocial PD, would be predictive in univariate models of increasing numbers of suicide attempts.

Method

Participants and Procedures

The current study includes the 431 participants who completed all 10 years of the CLPS, a multi-site, prospective, naturalistic study designed to assess the course and outcome of patients with PDs and a comparison group of patients with current major depressive disorder (MDD) but no PD. CLPS enrolled 668 participants aged 18-45 years old with at least one of four index PD's (schizotypal PD, borderline PD, avoidant PD, and obsessive compulsive PD), or with current MDD without any PD. Details of the CLPS methods and participants, including specific cooccurrence patterns among diagnoses, have been reported (McGlashan et al., 2000). On average, participants met for 2.1 PD diagnoses at baseline, a rate comparable with other clinical studies that were not selected for index PDs (Becker et al., 2000) increasing confidence in the generalizability of this sample to other clinical samples. The mean age of the subjects at entry into the study was 33 (SD = 8.1). Demographic frequencies are reported in Table 1.

All participants provided written informed consent following a full description of study procedures. Each collaborating site's Institutional Review Board approved the study protocol. Interviewers were experienced research-clinicians with masters/doctoral degrees in mental health disciplines who underwent standardized training to achieve reliability in diagnostic measures and were supervised by investigators within and across sites to maintain reliability and prevent temporal drift.

At baseline, interviewers administered the Diagnostic Interview for *DSM-IV* Personality Disorders (DIPD-IV; Zanarini et al., 1996), a semi-structured interview of all *DSM-IV* PDs. In CLPS, inter-rater and test-retest reliability of the DIPD-IV for the PDs was good to excellent (Zanarini et al., 2000). For this analysis, dimensional scores were computed for each PD by summing the 0, 1, and 2 for each PD criterion in to a total symptom count. Borderline PD was computed and run both with the suicide-related criterion included and excluded from the summed score. Suicide attempts were assessed using the Longitudinal Interval Follow-up Evaluation (LIFE; Keller et al., 1987). The LIFE is a semi-structured

interview rating system for assessing the longitudinal course of mental disorders, functioning, and suicidal behavior. The number of suicide attempts and gestures are recorded on a monthly basis. Evaluators make detailed ratings of intent and medical threat. In order to distinguish these analyses definitively from non-suicidal self-injury, which may have very different predictors, suicide attempt was coded as present if intent was assessed as at least *definite* and medical threat at least *mild*. Participants were re-interviewed at 6 and 12 months and yearly thereafter for 10 years following baseline.

Analysis

Suicide attempts are rare events even among individuals in clinical populations, resulting in a distribution of suicide attempt counts with a high frequency of zeros followed by a sharp positive skew of attempt counts. This undermines assumptions underlying commonly used analytic techniques (e.g., linear regression/correlation), but also may be suggestive of distinct psychological processes associated with ever attempting suicide vs. multiple attempts (Atkins & Gallop, 2007; Wright, Pincus, & Lenzenweger, 2012). Past analyses have primarily tried to deal with this pattern of data by focusing only on suicide attempters, grouping individuals by numbers of attempts (e.g., single, 2-4 attempts, 5-7 attempts, etc.), or comparing single versus multiple attempters as separate groups in search of distinguishing characteristics. Each of these approaches fails to adequately account for the observed distribution of rare events leading to potential misestimation of risk associated with predictors. Furthermore, these approaches do not separately evaluate whether distinct predictors account for who makes any attempt as opposed to those who make an increasing number of attempts beyond the first.

Past conflicting findings may be better understood by considering whether relatively under-assessed PDs account for a different risk process in suicide outcomes (e.g., one PD predicts first attempt while another PD predicts increasing attempts). Two-step count models (e.g., zero-inflated Poisson regression [ZIP]) offer an analytic framework for evaluating these data patterns (Atkins & Gallop, 2007; Wright, Pincus, & Lenzenweger, 2012). In ZIP regression, a class of individuals who will never attempt suicide is estimated from the excess of zeros (i.e., zero-inflation) beyond the number expectable from a standard Poisson distribution. This modeling approach then uses a mixture model to combine logistic and count regression to simultaneously identify predictors that distinguish subjects who will never attempt suicide from those who will, and to identify risk factors for increasing numbers of suicide attempts among those within the attempter class (Cameron & Trivedi, 1998). In ZIP models, the predictors that are included and that achieve significance can vary across the steps of the model, allowing for identification of distinct processes. For example, certain diagnoses may be associated with ever attempting suicide, whereas other diagnoses may predict making multiple attempts beyond the first. As the data might suggest, different processes may be involved with each step, and as a result this would be important to explicitly model. Therefore examining both multiple PD diagnoses and considering increasing numbers of suicide attempts using appropriate modeling techniques is a needed extension of existing literature. Despite the obvious benefits of these models for suicide research, only one prior study has used them to examine risk factors for multiple self-harm events (Bethell, Rhodes,

Bondy, Lou & Guttman, 2010), and none has examined these with suicide attempts or with PDs as predictors.

A series of ZIP models were estimated in Mplus 6.12 (Muthén & Muthén, 2011). The Vuong (1989) likelihood-ratio test was used to compare ZIP models against basic count models (e.g., Poisson) and other two-step count models (e.g., negative-binomial hurdle). In each case the ZIP model fit significantly better based on the Vuong statistics thereby supporting the use of this specific distribution for the models reported here. Initially, univariate models were estimated predicting the number of suicide attempts from individual PD symptom counts, with the same PD entered as predictor of the logistic step (i.e., attempter vs. non-attempter) and the count step (i.e., number of attempts if in the attempter class). Second, a multivariate model was estimated with all PDs entered simultaneously as predictors. All models included sex as a covariate as gender differences have previously been associated with suicide risk and with prevalence of PD diagnoses. Coefficients were exponentiated to the respective effect sizes associated with logistic (Odds Ratio) and count (Rate Ratios) regression.

Results

Table 2 summarizes coefficients, significance tests, and model fit for each model. In univariate models, paranoid, antisocial, borderline, histrionic, and dependent PD symptoms predicted ever making a suicide attempt. Only narcissistic PD symptoms predicted the number of suicide attempts beyond the initial attempt over the course of the 10 years of the study. In the multivariate model only BPD remained a significant predictor of any attempt in the presence of all PDs, whereas narcissistic PD remained the sole significant predictor of multiple attempts. These findings persisted when the BPD score without the self-harm criterion was entered in the model.

Discussion

The present findings demonstrate the unique effects of the severity of both borderline PD and narcissistic PD in predicting suicide attempts over ten years using a prospective, naturalistic longitudinal method. Our study is the first to examine PDs prospectively as risk factors for suicide attempts using ZIP models and demonstrates the utility of these models for assessing PD risk factors for multiple suicide attempts in a prospective longitudinal study. These findings also demonstrate the differences in associations between dimensions of personality pathology and suicide attempts when comparing univariate models to multivariate models.

When evaluated independently, several PD dimensions emerged as risk factors for ever attempting: paranoid, antisocial, borderline, histrionic, and dependent PDs. Multivariate models, however, found BPD severity uniquely predicted ever attempting suicide over other PD severity. This replicates prior findings that BPD is a significant risk factor for ever making a suicide attempt (Bolton & Robinson, 2010) and likely reflects common variance underlying multiple PDs that is most strongly associated with BPD (e.g., emotional

dysregulation or impulsive aggression endophenotypes; Bornovalova, et al. , 2005; McGirr, et al, 2009).

Research exploring risk factors associated with suicide attempts in BPD has found a multitude of complex and interrelated factors including depression, substance use, trauma, and affective instability (Wedig et al., 2012). Prior research from CLPS identified negative affect as the most robust trait predictor of suicide attempts (Yen et al, 2009). As many of these risk factors occur across PDs, further research is needed to determine which factors underlie the common variance among these PDs that is associated with ever making an attempt. Understanding this may highlight novel assessment methods for suicide attempts or target mechanisms underlying the risk for attempting suicide.

Contrary to our predictions, BPD did not predict an increasing number of attempts. The ZIP models found NPD to be the sole predictor of an increasing number of suicide attempts in either univariate or multivariate models. This effect held when the other PDs, including other Cluster B PDs, were entered in the model indicating that the risk is uniquely associated with NPD severity. Given these findings, it is important that suicide assessment recommendations and clinical practice include assessment and consideration of pathological narcissism when evaluating suicide risk, particularly in the context of a history of attempts.

Other research suggests associations of narcissistic PD with less impulsive but more lethal attempts (Blasco-Fontecilla et al., 2009) and that suicide attempts in narcissists are preceded by work related life events (Blasco-Fontecilla, et al, 2010). Over all there has been limited prior research examining what *unique* mechanisms underlying narcissistic pathology are associated with increased risk for suicide outcomes. Narcissistic pathology is often associated with emotional dysregulation that accompanies failures to meet entitled expectations that may result in interpersonally aggressive or hostile behaviors (Ogrodniczuk et al, 2009). In addition, deficits in emotional empathy distinguish NPD from BPD (Ritter et al, 2011) and may reflect social cognition deficits that further contribute to problematic relating with others. Further research should determine whether it is the emotional dysregulation, impulsivity, and/or problematic social cognition or interpersonal patterns that explain the risk for multiple attempts in narcissistic PD found in the present study and how it is distinct from the BPD risk for every making an attempt.

Shame proneness has an established association with suicidality and self-harm (Bryan, Morrow, Etienne, Ray-Sannerud, 2103; Schoenleber, Berenbaum, & Motl, 2014, Wiklander et al, 2012). Shame is also hypothesized as a mediating link between pathological narcissism and suicide related outcomes (Links, 2013; Ronningstam & Maltzberger, 1998). However, self-conscious emotions may underlie a range of personality pathology. A longitudinal study of BPD found significant associations between BPD and shame over 16 years, particularly associations with childhood trauma (Karan, Niesten, Frankenburg, Fitzmaurice, & Zanarini, 2014). A comparison between BPD, NPD and control patients found that NPD patients did not have as high explicit shame as BPD patients, although they did report higher levels of implicit shame than controls of BPD patients (Ritter et al., 2014). In addition, a study examining a neuroanatomical difference postmortem in suicide completers has found evidence of disruption in the von Economo neurons that may relate to pathological levels of

negative self-referential emotions such as shame (Brüne et al., 2011). Overall, these findings point to the possibility that shame proneness may play a role in the association between NPD and increasing number of suicide attempts.

The CLPS sample is one of few studies to prospectively follow personality-disordered individuals and annually assess their suicide attempts. As with any study, sampling techniques and inclusion criteria may limit the generalizability of findings. Participants had to meet criteria for one of four index PDs to enter the study, thus our ability to detect effects for non-study PDs may be more limited. However, PD diagnoses frequently co-occur across patient groups (Becker et al., 2000). CLPS subjects had on average between two and three PD diagnoses at baseline (McGlashan et al., 2000). However, the potential exclusion of subjects with primary diagnoses of other PDs may limit the generalizability of these findings to other settings or samples. Most participants were outpatients, and findings might differ in forensic, inpatient, or in non-treatment-seeking populations. On the other hand, suicide attempt risk assessment matters most with outpatients, who receive less intense daily monitoring yet exhibit substantial symptoms or impairment that warrant treatment.

The study findings convey the importance and utility of using two-step count models when examining rarely occurring psychological phenomena such as suicide attempts. The current findings support prior research identifying borderline personality pathology as a risk for ever attempting suicide. These findings also highlight the relevance of narcissistic pathology as a unique component of personality pathology relevant for evaluating clinical risk for multiple suicide attempts. Notably, while treatment research for self-harm and BPD has expanded over the last decade, there is a dearth of empirically supported treatments or treatment research on NPD. It may be that current treatment approaches widely used for suicidal behaviors are less effective for NPD patients, resulting in less engagement in treatment systems which may mitigate subsequent attempts. Future research on suicide risk factors should incorporate assessment of all PDs, particularly BPD and NPD, and consider using these models to examine factors and processes which contribute to ever making an attempt versus risk for increasing number of attempts.

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Table 1

Demographics of Sample

	Percentage	Frequency
Female	65.2	281
Ethnicity		
Caucasian	76.6	330
African American	12.1	52
Hispanic	8.6	37
Asian	1.9	8
Other	0.8	4
Axis I Disorders		
MDD	76.8	331
Bipolar II disorder	3.7	16
Substance abuse/dependence	35.3	152
Alcohol abuse/dependence	37.6	162
Posttraumatic Stress Disorder	29.5	127
Panic Disorder	25.8	111
Social Anxiety Disorder	25.8	111
Generalized Anxiety Disorder	23.0	99
Obsessive Compulsive Disorder	18.1	78
Eating Disorder	27.8	120
Personality Disorder¹		
Paranoid	22.1	95
Schizoid	9.1	39
Schizotypal	20.2	87
Borderline	42.0	181
Histrionic	3.5	15
Narcissistic	10.0	43
Antisocial	9.7	42
Avoidant	54.5	235
Dependent	12.5	54
Obsessive-Compulsive	46.6	201
MDD but no PD	14.4	62
Suicide Attempts²		
Frequency	13.5	58
Range	0 - 11	

n = 431

¹ Reports the number of participants exceeding, meeting, or having one criterion below threshold for the specified personality disorder diagnosis. Analysis was run using counts of criteria met for each PD.

² Defined as having at least definite intent and mild medical lethality.

Table 2

Summary of model coefficients and fit.

	<u>Logistic Step (Attempter)</u>		<u>Poisson Step (Number of Attempts)</u>	
	OR	<i>p</i>	RR	<i>p</i>
<i>Univariate Models</i>				
Paranoid	1.12	0.043	0.95	0.339
Schizoid	1.03	0.666	1.06	0.445
Schizotypal	1.07	0.142	1.05	0.324
Antisocial	1.11	0.007	0.99	0.574
Borderline	1.52	0.000	1.02	0.762
Histrionic	1.13	0.037	1.03	0.486
Narcissistic	0.97	0.497	1.15	0.000
Avoidant	1.08	0.061	0.97	0.631
Dependent	1.15	0.023	0.98	0.753
Obsessive	0.99	0.842	0.95	0.291
<i>Multivariate Model</i>				
	OR	<i>p</i>	RR	<i>p</i>
Paranoid	0.83	0.088	1.00	0.990
Schizoid	0.91	0.490	1.08	0.354
Schizotypal	1.08	0.316	1.00	0.961
Antisocial	1.12	0.057	0.95	0.079
Borderline	1.77	0.000	0.97	0.784
Histrionic	1.03	0.855	0.97	0.696
Narcissistic	0.83	0.081	1.18	0.000
Avoidant	1.03	0.567	0.98	0.673
Dependent	0.90	0.251	1.10	0.181
Obsessive	1.05	0.510	0.91	0.093

Note. $N=431$. OR=Odds Ratio; RR=Rate Ratio; All model coefficients estimated controlling for gender. The signs of coefficients for the logistic step were reversed before exponentiating them, because Mplus 6.12 predicts the zero-class (i.e., never attempter) as opposed to the non-zero class. As reported, the logistic and count coefficients can be interpreted as predicting in the same direction (i.e., towards any or more attempts, respectively).