Published in final edited form as:

Psychol Med. 2012 November ; 42(11): 2395–2404. doi:10.1017/S0033291712000517.

Predictors of Suicide Attempts in Patients with Borderline Personality Disorder Over 16 Years of Prospective Follow-up

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Abstract

Background—It is clinically important to understand the factors that increase the likelihood of the frequent and recurrent suicide attempts seen in those with borderline personality disorder (BPD). Although a number of studies have examined this subject in a cross-sectional manner, the goal of this study was to determine the most clinically relevant baseline and time-varying predictors of suicide attempts over 16 years of prospective follow-up among patients with BPD.

Methods—Two-hundred and ninety inpatients meeting Revised Diagnostic Interview for Borderlines (DIB-R) and DSM-III-R criteria for BPD were assessed during their index admission using a series of semistructured interviews and self-report measures. These subjects were then reassessed using the same instruments every two years. The generalized estimating equations (GEE) approach was to model the odds of suicide attempts in longitudinal analyses, controlling for assessment period, yielding an odds ratio and 95% confidence interval for each predictor.

Results—Nineteen variables were found to be significant bivariate predictors of suicide attempts. Eight of these, seven of which were time-varying, remained significant in multivariate analyses: diagnosis of major depression, substance use disorder, post-traumatic stress disorder, presence of self-harm, adult sexual assault, having a caretaker who has completed suicide, affective instability, and more severe dissociation.

Conclusions—The results of this study suggest that prediction of suicide attempts among borderline patients is complex, involving co-occurring disorders, co-occurring symptoms of BPD (self-harm, affective reactivity, and dissociation), adult adversity, and a family history of completed suicide.

Clinical experience and prior research suggests that borderline personality disorder (BPD) incorporates four sectors of psychopathology that need to be present concurrently: aspects of dysphoric affect, cognitive disturbances ranging from overvalued ideas to quasi-psychotic thought, difficulties with impulsivity, and troubled relationships (Zanarini, Gunderson et al. 1989). Furthermore, repeated suicide threats, gestures, and attempts is currently a defining diagnostic criterion for borderline personality disorder. Research suggests that as many as 70% of those with BPD have attempted suicide in their lifetime and 5–10% successfully complete suicide (Black, Blum et al. 2004; Zanarini, Frankenburg et al. 2005; McGirr, Paris et al. 2007); this rate is much higher than that found in the general population (Gunderson 2001). Such behaviors involve suicidal intent and typically involve at least some intent to

die. This is differentiated from non-suicidal self-injury in which there is no intent to die (Nock and Favazza 2009). Given the high rate and potential lethality of suicide attempts among borderline patients, it is important to understand which factors might increase the likelihood of attempting suicide in this population in order to improve our methods of intervention and prevention.

Prior cross-sectional studies have examined a wide range of predictors of suicide attempts in BPD. These studies have found diagnostic predictors of suicide attempts in BPD: comorbid major depressive disorder (Soloff, Lynch et al. 2000; Brodsky, Groves et al. 2006), substance use disorders (Fyer, Frances et al. 1988; van den Bosch, Verheul et al. 2001; Wilson, Fertuck et al. 2006), and post-traumatic stress disorder (Pagura, Stein et al. 2010). Younger age has also been associated with increased suicide attempts in BPD (Stepp and Pilkonis 2008). In addition, the co-occurring symptom of impulsivity (Brodsky, Malone et al. 1997; Chesin, Jeglic et al. 2010) has also been associated with suicide attempts in this population. Furthermore, in studies of patients with BPD, childhood adversity, including both childhood physical and sexual abuse, has been implicated as a predictor of suicide attempts in cross-sectional studies (Brodsky, Malone et al. 1997).

Some longitudinal studies have identified predictors of suicide attempts in BPD as well. One study by Soloff and Fabio (2008) found that in addition to comorbid major depression, the presence of a hospitalization prior to any suicide attempt, lower Global Assessment of Functioning (GAF) score at baseline, and poor social adjustment predicted suicide attempts at future follow-up points. However, the longest follow-up in this study was five years. The Collaborative Longitudinal Personality Disorders Study has also identified some predictors of suicide attempts in BPD. Using data from eight years of follow-up, this study identified specific symptoms of BPD as predictors of suicide attempts in borderline patients: self-harm (Yen, Shea et al. 2011), affective instability (Yen, Shea et al. 2004), and general negative temperament (Yen, Shea et al. 2009). Using data from this study, Yen and colleagues (2009) also examined several facets of impulsivity, another symptom of BPD, and found that only the facet of lack of planning and premeditation was significantly associated with suicide attempt status.

Thus, a wide range of predictors of suicide attempts have been examined in those with BPD. Although some longitudinal data has been published on predictors of suicide attempts in BPD, none have examined follow-up beyond 8 years. The current study utilized data from the McLean Study of Adult Development (MSAD) and employed a large, carefully diagnosed, and socioeconomically diverse sample of individuals with borderline personality disorder. From this rich data set we selected a series of prospective predictors of suicide attempts over 16 years of follow-up data, examining most of the predictors identified by others in prior studies, as well as additional predictors thought to be clinically relevant. We examined predictors examined previously, including: age, comorbid major depressive disorder, substance use disorders, and post-traumatic stress disorder, baseline number of hospitalizations, baseline number of suicide attempts, the presence of self-harm, baseline GAF, childhood physical and sexual abuse, impulsivity, temperament, affective instability, and measures of social adjustment (i.e., on SSDI). In addition we tested variables thought to be clinically related to suicide attempts in those with BPD including: sex, race, caretaker suicide attempts, completion, and self-harm, adult physical and sexual assault, and dissociation. We tested these variables in both bivariate and multivariate models to examine how these baseline and time-varying predictors function over time.

Method

Procedures

The methodology of this study, which was reviewed and approved by the McLean Hospital Institutional Review Board, has been described in detail elsewhere (Zanarini, Frankenburg et al. 2003). Briefly, all subjects were initially inpatients at McLean Hospital in Belmont, Massachusetts. Each patient was first screened to determine that he or she: 1) was between the ages of 18–35; 2) had a known or estimated IQ of 71 or higher; 3) had no history or current symptoms of schizophrenia, schizoaffective disorder, bipolar I disorder, or an organic condition that could cause psychiatric symptoms; and 4) was fluent in English.

After the study procedures were explained, written informed consent was obtained. Each patient then met with a masters-level interviewer blind to the patient's clinical diagnoses for a thorough diagnostic assessment. Three semistructured diagnostic interviews were administered. These diagnostic interviews were: 1) the Structured Clinical Interview for DSM-III-R Axis I Disorders (SCID-I, Spitzer, Williams et al. 1992) to assess for the presence of axis I psychiatric disorders, 2) the Revised Diagnostic Interview for Borderlines (DIB-R, Zanarini, Gunderson et al. 1989) to assess the presence and severity of symptoms of BPD, and 3) the Diagnostic Interview for DSM-III-R Personality Disorders (DIPD-R, Zanarini, Frankenburg et al. 1987) to assess for the presence and severity of BPD and other axis II disorders. The inter-rater and test-retest reliability of all three of these measures have been found to be good-excellent (SCID: median $K = .80$, DIPD-R: median $K = .85$, Zanarini and Frankenburg 2001) (DIB-R: median $K = .80$, Zanarini, Frankenburg et al. 2002).

In the current study the presence of affective instability was derived from the DIPD-R, as it is not included in the DIB-R, and the presence of impulsivity was derived from the DIB-R and the DIPD-R as they have identical items assessing impulsivity. To avoid overlap between the separate variables of substance abuse and self-harm (see below) these items were removed from the impulsivity subscale of the DIB-R and the remaining impulsive behaviors were counted to create a continuous measure of impulsivity. Thus, only items regarding promiscuity, paraphilias, eating binges, spending sprees, gambling sprees, verbal outbursts, physical fights, physical threats, physical assaults, property damage, reckless driving, and antisocial behavior were counted in this impulsivity variable.

Three other semistructured interviews were also administered at baseline. These interviews were: 1) the Lifetime Self-destructiveness Scale (LSDS, Zanarini, Frankenburg et al. 2006) providing information about the presence and severity of suicidal and non-suicidal self-injurious behaviors, 2) the Abuse History Interview (AHI, Zanarini, Frankenburg et al. 2005) assessing for the presence of emotional, verbal, physical and sexual abuse, and 3) the Revised Childhood Experiences Questionnaire (CEQ-R, Zanarini, Williams et al. 1997) probing for the presence of childhood adversity. The interrater and test-retest reliability of these interviews have also been found to be good-excellent (LSDS: median $K = 1.0$, Zanarini, Frankenburg et al. 2008) (AHI: median $K = .78$, Zanarini, Frankenburg et al. 2005) (CEQ-R: median $K = .88$, Skodol, Bender et al. 2007). From the LSDS we obtained information regarding the presence or absence of a suicide attempt and the presence or absence of self-harm during each follow-up. From the AHI we obtained information regarding adult physical and sexual abuse. From the CEQ-R we obtained data regarding childhood abuse and neglect, including the presence of childhood sexual abuse. A continuous measure of childhood abuse was calculated by adding up the number of age periods (early childhood, latency and adolescence) that a male or female caretaker was reported to have verbally, emotionally, or physically abused the subject, resulting in a summary score of 0 to 18. Similarly, a continuous measure of the severity of childhood neglect was calculated by adding up the number of age periods that a male or female

caretaker was reported to have engaged in seven forms of neglect (caretaker's physical neglect, emotional withdrawal, inconsistent treatment, denial of subject's thoughts and feelings, failure to establish a real relationship with subject, placing subject in a parent role, and failure to provide needed protection), resulting in a summary score that ranged from 0 to 42. From the CEQ-R we also determined the presence of having had a caretaker attempt or successfully complete suicide or engage in self-harm.

At each of eight follow-up waves, separated by 24 months, axis I and II psychopathology was reassessed via interview methods similar to the baseline procedures by staff members blind to baseline diagnoses. After informed consent was obtained, our diagnostic battery was readministered (with the SCID I focusing on the past two years and not lifetime axis I psychopathology as at baseline). The follow-up interrater reliability (within one generation of follow-up raters) and follow-up longitudinal reliability (from one generation of raters to the next) of these three measures have been found to be good-excellent (SCID: median $K = .93$, DIPD-R: median $K = .86$, Zanarini and Frankenburg 2001) (DIB-R: median $K = .92$, Zanarini, Frankenburg et al. 2002).

The follow-up versions of the LSDS and the AHI were also administered at each of the study's eight follow-up periods. The follow-up interrater reliability and follow-up longitudinal reliability of these two measures have also been found to be good-excellent (LSDS: median $K = .92$, Zanarini, Frankenburg et al. 2006) (AHI: median $K = .87$, Zanarini, Frankenburg et al. 2005).

In addition, the Dissociative Experiences Scale (DES), a 28-item self-report questionnaire, measuring the severity of dissociative experiences was administered at baseline and each of the eight waves of follow-up (Zanarini, Frankenburg et al. 2008). The DES has been found to have good test-retest ($r = .84$) and split-half reliability ($r = .71-.96$) (Bernstein and Putnam 1986). It has also been found to have construct and criterion validity. In this measure, subjects are asked to rate the percentage of the time that each inner state is experienced, with a range of 0–100%. We also used data from the NEO-Five Factor Inventory (NEO-FFI) collected at baseline and 6-year to 16-year follow-up. Because the NEO-FFI was not collected at the 2- and 4-year follow-ups, a multiple imputation procedure, by a series of chained equations (as implemented in Stata Version 9.2, StataCorp 2005), was used to conduct analyses including data from 2- and 4-year follow-up time points. The imputation procedure utilized 10 imputations and incorporated both baseline and 6- though 16-year follow-up NEO-FFI data as predictors of the missing 2- and 4-year follow-up NEO-FFI data. To assess the sensitivity of the results to this imputations procedure, all analyses were re-run without imputed baseline data and results were similar. The NEO-FFI is a 60-item measure designed to assess five aspects of normal temperament with 12 items comprising each factor, rated on a scale from zero to four: neuroticism, extraversion, openness, agreeableness, and conscientiousness (Costa and McCrae 1992). This is a commonly used measure of normal temperament and shows correlations of 0.75–0.89 with the longer 240-item NEO Personality Inventory Revised (NEO-PI-R, Costa and McCrae 1992). Furthermore, the NEO-FFI reports alphas between .76 and .90 for the five factors (Costa and McCrae 1992).

Our binary outcome was the presence/absence of a suicide attempt during the baseline period and each of the study's eight follow-up periods as gathered from the LSDS. A suicide attempt was defined as engagement in self-injurious behavior with at least some intent to die.

Participants

Two hundred and ninety patients met both DIB-R and DSM-III-R criteria for BPD. In terms of baseline demographic data, 80.3% ($N=233$) of the subjects were female and 87.2% ($N=253$) were white. The average age of the borderline subjects was 26.9 years ($SD=5.8$), their mean socioeconomic status was 3.4 ($SD=1.5$) (where 1=highest and 5=lowest, Hollingshead 1957), and their mean Global Assessment of Functioning (GAF) score was 38.9 ($SD=7.5$) (indicating major impairment in several areas, such as work or school, family relations, judgment, thinking, or mood).

In terms of continuing participation, 87.5% ($N=231/264$) of surviving borderline patients (13 committed suicide and 13 died of other causes) were reinterviewed at all eight follow-up waves.

Statistical Analyses

Descriptive statistics were used to report the frequencies, means, SD , and range of the predictor and outcome variables. Categorical variables are reported as % (n) and continuous data are presented as means (SD , range). Statistical significance was determined by two-tailed $p<0.05$.

The generalized estimating equations (GEE) approach was used in longitudinal analyses of the predictors of the presence of suicide attempts using Stata 11.2 (StataCorp 2009). These analyses modeled the log odds (or logit of the prevalence) of suicide attempts at each occasion, yielding an odds ratio (OR) and 95% confidence interval (95% CI) for the association with a given predictor. Analyses also appropriately accounted for the correlation among the repeated measures of suicide attempts. In all analyses we controlled for assessment period via the inclusion of a quadratic time trend to allow for the discernible non-linear decline in prevalence over time. We first assessed the relationship between each baseline and time-varying predictor variable and the presence of a suicide attempt in a bivariate fashion, while controlling for assessment period. Next, to select the subset of predictors to be retained in the most parsimonious multivariate model, we entered all the significant variables from the bivariate analyses simultaneously and followed a backward deletion procedure, singularly deleting one variable at a time based on which variable was least significant until all variables remaining were statistically significant at $p<0.05$. In this analysis, assessment period was always included as a covariate to allow for temporal variation in the prevalence of suicide attempts.

Results

The following prevalence rates for suicide attempts were found at the study's nine measurement periods: 79.3% ($N=230$) at baseline, 34.2% ($N=94$) at two-year follow-up, 20.1% ($N=54$) at four-year follow-up, 16.7% ($N=44$) at six-year follow-up, 14.1% ($N=36$) at eight-year follow-up, 12.9% ($N=32$) at ten-year follow-up, 12.3% ($N=30$) at 12-year follow-up, 8.0% ($N=19$) at 14-year follow-up, and 8.2% ($N=19$) at 16-year follow-up.

We first selected 12 predictor variables measured at baseline based on our review of the previous literature to serve as bivariate predictors of suicide attempts. We used age at baseline, sex, and race as bivariate demographic predictors. We also selected number of prior suicide attempts and number of hospitalizations at baseline rather than across time to avoid problems with circularity. Participants had a mean number of 6.08 prior suicide attempts at baseline ($SD=14.14$, range=0–180) and a mean number of 5.62 prior hospitalizations ($SD=6.99$, range=0–35). Sixty-two percent ($N=181$) of participants reported a childhood history of sexual abuse and the severity of other childhood abuse was found to

have a mean of 7.28 (SD=5.34, range=0–18). The severity of childhood neglect had a mean of 14.68 (SD=10.66, range=0–42). Finally, we assessed whether participants had a caretaker who had attempted or successfully completed suicide, or engaged in self-injury. Results suggested that 15.5% ($N=45$) of participants had a caretaker who had attempted suicide, 2.8% ($N=8$) had a caretaker who had completed suicide, and 9.0% ($N=26$) had a caretaker who had engaged in self-harm.

Fifteen time-varying variables were also selected based on prior research. Table 1 presents the prevalence of major depression (MDD), substance use disorders (SUD), post-traumatic stress disorder (PTSD), self-harm, adult physical and sexual assault, affective instability, and those on social security disability (SSDI) across the follow-up periods. With the exception of SSDI, which remained relatively stable over follow-up, rates of the remaining nine variables in Table 1 generally declined from baseline to 16-year follow-up.

Table 2 depicts the mean scores and standard deviations for the Dissociative Experiences Scale (DES), the number of impulsive actions across all follow-up periods, and the five factors of the NEO-FFI. This table shows that DES scores decrease until 10-year follow-up and then level off, while the number of impulsive actions drops off sharply early on and then stays relatively constant. All the factors from the NEO remain relatively constant across all the time periods.

Table 3 presents the bivariate predictors of suicide attempts across each of the measurement periods. As mentioned above, each analysis was conducted controlling for assessment period using quadratic time trends. Nineteen of the 27 variables tested were significant at the $p<0.05$ level. One demographic variable, age, was statistically significant, in that older age increased the risk of future suicide attempts, and all the clinical variables tested were statistically significant predictors of suicide attempts. These were: MDD, SUD, PTSD, self-harm, higher score on the DES, higher number of suicide attempts assessed at baseline, higher baseline number of hospitalizations, and lower baseline Global Assessment of Functioning (GAF) score. Significant psychosocial predictors were: severity of childhood neglect, childhood sexual abuse, adult physical and sexual assault, being on SSDI, and having had a caretaker complete suicide. Finally, five personality/temperament variables significantly predicted suicide attempts in the bivariate analyses, namely the presence of affective instability, increased impulsivity, and high neuroticism and lower extraversion scores on the NEO-FFI.

Table 4 depicts the multivariate model obtained after the backwards deletion procedure, having used the significant bivariate predictors in the initial model. In this model, eight of the original predictors remain statistically significant: having a diagnosis of MDD, SUD, or PTSD, the presence of self-harm, adult sexual assault, having had a caretaker complete suicide, affective instability, and a higher score on the DES. The odds ratios reported in Table 4 indicate that a diagnosis of MDD, SUD, or PTSD is associated with an approximately 2-fold increase in the odds of a suicide attempt. Similarly, experiencing a sexual assault as an adult was also associated with a comparable increase in the odds of a suicide attempt. The presence of self-harm and having had a caretaker complete suicide was associated with a an almost 3-fold increase in the odds of a suicide attempt, while affective instability and 10-point increases on the DES were associated with smaller, approximately 1.5-fold and 1-fold increases in the odds of making an attempt, respectively.

Discussion

Results from the current study suggest that a wide range of demographic, clinical, psychosocial, and personality/temperament variables predict future suicide attempts in those

with BPD when examined over 16 years of prospective follow-up. Specifically, when examined in a bivariate manner, previously examined variables of older age, diagnoses of major depressive disorder (MDD), substance use disorder (SUD), and post-traumatic stress disorder (PTSD), the presence of self-harm, increased number of baseline suicide attempts, higher number of hospitalizations at baseline, lower baseline Global Assessment of Functioning (GAF) score, severity of childhood neglect, childhood sexual abuse, being on social security disability insurance (SSDI) as a measure of social adjustment, the presence of affective instability, greater impulsivity, and high neuroticism, and low extraversion all predicted future suicide attempts. Additionally, new variables tested in this study including: adult physical and sexual assault, having had a caretaker complete suicide, and more severe dissociation also predict future suicide attempts. However, when examined in a multivariate fashion, eight of these variables remain in the model. These were: MDD, SUD, PTSD, self-harm, adult sexual assault, having a caretaker who has completed suicide, affective instability, and more severe dissociative experiences, incorporating both previously examined variables and those new to this study.

The majority of those variables tested in the current study that have been examined previously remained significant predictors in our bivariate analyses. The variables that were not found to be significant are interesting because of their presumed clinical relevance (i.e., sex, race, caretaker self-injury, aspects of personality) and the fact that some of them have been found to be significant predictors of suicide attempts in prior studies of those with BPD (i.e., other childhood abuse, Brodsky, Malone et al. 1997) and in the population more generally (i.e., sex, Weissman, Bland et al. 1999; Nojomi, Malakouti et al. 2007; Nock, Borges et al. 2008; Borges, Nock et al. 2010).

Three of the variables that remained significant in the multivariate analysis are clinical diagnoses. Given the considerable role of MDD in predicting suicide attempts more generally (Borges, Angst et al. 2008; Wilcox, Arria et al. 2010) and the large role that dysphoric mood plays in BPD (Zanarini, Frankenburg et al. 1998), this predictor makes clinical sense. Similarly, the impulsivity and decreased inhibition associated with substance use disorders may be strong contributors to suicide attempts, especially in those with BPD where ongoing impulsivity is a defining feature. PTSD has also previously been found to be a predictor of suicide attempts in those with BPD (Pagura, Stein et al. 2010) and it may be that the additional re-experiencing, emotional avoidance, and arousal symptoms of this disorder might be especially taxing on those with BPD who already are struggling with an underlying affective lability.

This effect of PTSD may be particularly salient in those in ongoing assaultive situations. It is interesting that only adult sexual assault remained significant and none of the childhood abuse or neglect variables remained significant in the multivariate model. This, in conjunction with ongoing PTSD as a significant predictor, might suggest that ongoing assault and current symptoms of PTSD have a greater impact on suicide attempts than difficult events that occurred in the more distal past.

Our finding that having had a caregiver complete suicide predicts future suicide attempts is a new one for BPD. Fear of and frantic efforts to avoid abandonment is a diagnostic criterion for BPD. Having a caretaker commit suicide is a traumatic abandonment that might lead to the desire to join the parent, follow his or her model, or to attachment problems or other disorders such as PTSD, which themselves may increase suicide risk. Thus having a caretaker commit suicide might be a particularly salient trauma for borderline patients. Having a caretaker merely attempt suicide or engage in self-injury do not provide the same kind of traumatic loss, and subsequently may, understandably, not be significant predictors. Furthermore, adoption, twin, and family studies support the view that the transmission of

suicide attempts is at least in part genetic (Brent and Mann 2005; Brent and Melhem 2008). Thus, the pattern of caretaker suicides predicting future suicide attempts in offspring may be in part environmental but also in part transmitted genetically.

A number of co-occurring symptoms of BPD were also found to be significant predictors of suicide attempts. The presence of affective instability makes it difficult to cope with situations such as the symptoms that come with a comorbid psychiatric diagnosis, sexual assault, and having a loved one complete suicide. Suicide has been cited as a method of ending emotional pain (Kraft, Jobes et al. 2010). Thus, it may make sense that difficult and unstable affect might contribute to individuals using suicide attempts as a solution. This may be particularly true for those with BPD where affective instability is a hallmark criterion of the disorder. Like suicide, dissociation has also often been cited as a method of disengaging from strong emotions (Stiglmayr, Ebner-Priemer et al. 2008; van Dijke, van der Hart et al. 2010). Thus, it may not be surprising that the two are related. Dissociation has also been seen as a way of coping with the stress of both childhood sexual abuse and adult sexual assault (Lipschitz, Kaplan et al. 1996), and in this way it is related to other predictors. However, it remains in the model after accounting for these other variables, suggesting that dissociation is an important predictor of suicide in its own right.

Finally, self-harm, a common co-occurring symptom in BPD (Gunderson 2001) and fellow-traveler with suicide attempts (Nock, Joiner et al. 2006) was also found to predict suicide attempts in BPD. Thus, this symptom, too, significantly increases the odds of making a suicide attempt over time. Self-harm might perhaps be seen as a “gateway” to more life threatening suicide attempts; however, it might also simply be a somewhat similar and co-occurring behavior. Future research is needed to further understand the nature of this relationship.

It should also be noted that impulsivity did not remain a significant predictor of suicide attempts in the multivariate analysis. This is of particular interest because impulsivity specifically has been found to be a predictor of suicide attempts in BPD previously (Brodsky, Malone et al. 1997; Yen, Shea et al. 2009). This may be because these prior studies included substance abuse and self-harm in their measures of impulsivity. The current study, by removing these aspects and testing them separately, demonstrates that these components of impulsivity more specifically predict suicide attempts across time.

Limitations and Future Directions

One limitation of this study is that all participants were initially inpatient in a private psychiatric hospital and were thus seriously ill at the start of the study. Similarly, the majority of participants were in treatment during each study period (Hörz, Zanarini et al. 2010). Thus, it is difficult to know if the results generalize to a less severely ill sample. Additionally, all data was obtained via self-report from participants themselves. Thus, it is difficult to know if the information obtained was exaggerated, minimized, or both at different times. Future research might use community samples as well as record review and informant interviews in an attempt to address some of these limitations. Furthermore, because the data were collected as the presence of each variable within a two year time-frame, we could not determine whether the predictors and outcome variable co-occurred. Thus this may have markedly underestimated the true effect-size in the study. Future research might attempt to ascertain the exact timing of the predictors and outcome variables to avoid this. Similarly, because the selection of the sample is to some extent selected for the outcome variable, the effects are likely to be attenuated because the selection of the sample is constricted. Future research might examine a wider selection of sample. Finally, it is true that many of the predictors and the outcome measure are criteria for BPD. However, we

used many predictors from the DIB-R, a more complex measure than the specific items outlined in the DSM, limiting the overlap and direct manifestation of liability for BPD.

Conclusions and Implications

Taken together, the results of this study suggest that the prediction of suicide attempts among borderline patients is complex, involving co-occurring disorders and co-occurring symptoms of BPD as well as aspects of adult adversity and a family history of completed suicide. Prediction of suicide attempts is a particular challenge (Paris 2006). Thus, the more accurate predictors we can identify amongst a given group the better our chances of predicting and preventing this lethal outcome. The current study identifies several predictors of suicide attempts in BPD, many of which are above and beyond those found in other disorders (i.e., MDD, bipolar disorder, schizophrenia). Although age and sex have been associated with suicide attempts in schizophrenia (Hor and Taylor 2010) and past history of suicide attempts (Oquendo, Currier et al. 2006) and impulsivity has been associated with suicide attempts in both unipolar and bipolar disorders (Perroud, Baud et al. 2011) other predictors found in this study do not generally overlap with previous work in the prediction of suicide attempts in other disorders. This suggests that clinicians should pay particular attention to these non-overlapping predictors when conducting suicide assessments in those with BPD.

Acknowledgments

This research was supported by NIMH grants MH47588 and MH62169.

References

- Bernstein EM, Putnam FW. Development, reliability, and validity of a dissociation scale. *Journal of Nervous and Mental Disease*. 1986; 174(12):727–735. [PubMed: 3783140]
- Black DW, Blum N, Pfohl B, et al. Suicidal behavior in borderline personality disorder: Prevalence, risk factors, prediction, and prevention. *Journal of Personality Disorders*. 2004; 18(3):226–239. [PubMed: 15237043]
- Borges G, Angst J, Nock MK, et al. Risk factors for the incidence and persistence of suicide-related outcomes: A 10-year follow-up study using the National Comorbidity Surveys. *Journal of Affective Disorders*. 2008; 105(1–3):25–33. [PubMed: 17507099]
- Borges G, Nock MK, Haro Abad JM, et al. Twelve-month prevalence of and risk factors for suicide attempts in the World Health Organization World Mental Health Surveys. *Journal of Clinical Psychiatry*. 2010; 71(12):1617–1628. [PubMed: 20816034]
- Brent DA, Mann JJ. Family genetic studies, suicide, and suicidal behavior. *American Journal of Medical Genetics Part C*. 2005; 133C(1):13–24.
- Brent DA, Melhem N. Familial transmission of suicidal behavior. *Psychiatric Clinics of North America*. 2008; 31(2):157–177. [PubMed: 18439442]
- Brodsky BS, Groves SA, Oquendo MA, et al. Interpersonal precipitants and suicide attempts in borderline personality disorder. *Suicide and Life Threatening Behavior*. 2006; 36(3):313–322. [PubMed: 16805659]
- Brodsky BS, Malone KM, Ellis SP, et al. Characteristics of borderline personality disorder associated with suicidal behavior. *American Journal of Psychiatry*. 1997; 154(12):1715–1719. [PubMed: 9396951]
- Chesin MS, Jeglic EL, Stanley B. Pathways to high-lethality suicide attempts in individuals with borderline personality disorder. *Archives of Suicide Research*. 2010; 14(4):342–362. [PubMed: 21082450]
- Costa, PT.; McCrae, RR. NEO PI-R: Professional Manual (Revised NEO Personality Inventory (NEO PI-R) and NEO Five-Factor Inventory (NEO-FFI). Odessa, FL: Psychological Assessment Resources, Inc; 1992.

- Fyer MR, Frances AJ, Sullivan T, et al. Suicide attempts in patients with borderline personality disorder. *American Journal of Psychiatry*. 1988; 145(6):737–739. [PubMed: 3369563]
- Gunderson, JG. *Borderline Personality Disorder: A Clinical Guide*. Washington, DC: American Psychiatric Publishing, Inc; 2001.
- Hollingshead, AB. *Two factor index of social position*. New Haven; CT: 1957.
- Hor K, Taylor M. Suicide and schizophrenia: A systematic review of rates and risk factors. *Journal of Psychopharmacology*. 2010; 24(4 Suppl):81–90. [PubMed: 20923923]
- Hörz S, Zanarini MC, Frankenburg FR, et al. Ten-year use of mental health services by patients with borderline personality disorder and with other axis II disorders. *Psychiatric Services*. 2010; 61(6): 612–616. [PubMed: 20513685]
- Kraft TL, Jobes DA, Lineberry TW, et al. Brief report: why suicide? Perceptions of suicidal inpatients and reflections of clinical researchers. *Archives of Suicide Research*. 2010; 14(4):375–382. [PubMed: 21082453]
- Lipschitz DS, Kaplan ML, Sorkenn J, et al. Childhood abuse, adult assault, and dissociation. *Comprehensive Psychiatry*. 1996; 37(4):261–266. [PubMed: 8826690]
- McGirr A, Paris J, Lesage A, et al. Risk factors for suicide completion in borderline personality disorder: A case-control study of cluster B comorbidity and impulsive aggression. *Journal of Clinical Psychiatry*. 2007; 68(5):721–729. [PubMed: 17503981]
- Nock MK, Borges G, Bromet EJ, et al. Cross-national prevalence and risk factors for suicidal ideation, plans and attempts. *British Journal of Psychiatry*. 2008; 192:98–105. [PubMed: 18245022]
- Nock, MK.; Favazza, AR. Nonsuicidal self-injury: Definition and classification. In: Nock, MK., editor. *Understanding Nonsuicidal Self-Injury*. Washington, DC: American Psychological Association; 2009.
- Nock MK, Joiner TE Jr, Gordon KH, et al. Non-suicidal self-injury among adolescents: Diagnostic correlates and relation to suicide attempts. *Psychiatry Research*. 2006; 144(1):65–72. [PubMed: 16887199]
- Nojomi M, Malakouti SK, Bolhari J, et al. A predictor model for suicide attempt: Evidence from a population-based study. *Archives of Iranian Medicine*. 2007; 10(4):452–458. [PubMed: 17903049]
- Oquendo MA, Currier D, Mann JJ. Prospective studies of suicidal behavior in major depressive and bipolar disorders: What is the evidence for predictive risk factors? *Acta Psychiatrica Scandinavica*. 2006; 114(3):151–158. [PubMed: 16889585]
- Pagura J, Stein MB, Bolton JM, et al. Comorbidity of borderline personality disorder and posttraumatic stress disorder in the U.S. population. *Journal Psychiatric Research*. 2010; 44 (16): 1190–1198.
- Paris J. Predicting and preventing suicide: Do we know enough to do either? *Harvard Review of Psychiatry*. 2006; 14(5):233–240. [PubMed: 16990168]
- Perroud N, Baud P, Mouthon D, et al. Impulsivity, aggression and suicidal behavior in unipolar and bipolar disorders. *Journal of Affective Disorders*. 2011; 134(1–3):112–118. [PubMed: 21723616]
- Skodol AE, Bender DS, Pagano ME, et al. Positive childhood experiences: Resilience and recovery from personality disorder in early adulthood. *Journal of Clinical Psychiatry*. 2007; 68(7):1102–1108. [PubMed: 17685749]
- Soloff PH, Fabio A. Prospective predictors of suicide attempts in borderline personality disorder at one, two, and two-to-five year follow-up. *Journal of Personality Disorders*. 2008; 22(2):123–134. [PubMed: 18419233]
- Soloff PH, Lynch KG, Kelly TM, et al. Characteristics of suicide attempts of patients with major depressive episode and borderline personality disorder: A comparative study. *American Journal of Psychiatry*. 2000; 157(4):601–608. [PubMed: 10739420]
- Spitzer RL, Williams JB, Gibbon M, et al. The Structured Clinical Interview for DSM-III-R (SCID). I: History, rationale, and description. *Archives of General Psychiatry*. 1992; 49(8):624–629. [PubMed: 1637252]
- StataCorp. *Stata Statistical Software: Release 9.2*. College Station, TX: StataCorp LP; 2005.
- StataCorp. *Stata Statistical Software: Release 11.2*. College Station, TX: StataCorp LP; 2009.

- Stepp SD, Pilkonis PA. Age-related differences in individual DSM criteria for borderline personality disorder. *Journal of Personality Disorders*. 2008; 22(4):427–432. [PubMed: 18684054]
- Stiglmayr CE, Ebner-Priemer UW, Bretz J, et al. Dissociative symptoms are positively related to stress in borderline personality disorder. *Acta Psychiatrica Scandinavica*. 2008; 117(2):139–147. [PubMed: 18028248]
- van den Bosch LM, Verheul R, van den Brink W. Substance abuse in borderline personality disorder: Clinical and etiological correlates. *Journal of Personality Disorders*. 2001; 15(5):416–424. [PubMed: 11723876]
- van Dijke A, van der Hart O, Ford JD, et al. Affect dysregulation and dissociation in borderline personality disorder and somatoform disorder: Differentiating inhibitory and excitatory experiencing states. *Journal of Trauma and Dissociation*. 2010; 11(4):424–443. [PubMed: 20938867]
- Weissman MM, Bland RC, Canino GJ, et al. Prevalence of suicide ideation and suicide attempts in nine countries. *Psychological Medicine*. 1999; 29(1):9–17. [PubMed: 10077289]
- Wilcox HC, Arria AM, Caldeira KM, et al. Prevalence and predictors of persistent suicide ideation, plans, and attempts during college. *Journal of Affective Disorders*. 2010; 127(1–3):287–294. [PubMed: 20471691]
- Wilson ST, Fertuck EA, Kwitel A, et al. Impulsivity, suicidality and alcohol use disorders in adolescents and young adults with borderline personality disorder. *International Journal of Adolescent Medical Health*. 2006; 18(1):189–196.
- Yen S, Shea MT, Sanislow CA, et al. Borderline personality disorder criteria associated with prospectively observed suicidal behavior. *American Journal of Psychiatry*. 2004; 161(7):1296–1298. [PubMed: 15229066]
- Yen S, Shea MT, Sanislow CA, et al. Personality traits as prospective predictors of suicide attempts. *Acta Psychiatrica Scandinavica*. 2009; 120(3):222–229. [PubMed: 19298413]
- Yen S, Shea MT, Walsh Z, et al. Self-harm subscale of the Schedule for Nonadaptive and Adaptive Personality (SNAP): Predicting suicide attempts over 8 years of follow-up. *Journal of Clinical Psychiatry*. 2011:e1–e7.
- Zanarini MC, Frankenburg FR. Attainment and maintenance of reliability of axis I and II disorders over the course of a longitudinal study. *Comprehensive Psychiatry*. 2001; 42 (5):369–374. [PubMed: 11559863]
- Zanarini MC, Frankenburg FR, Chauncey DL, et al. The diagnostic interview for personality disorders: Inter-rater and test-retest reliability. *Comprehensive Psychiatry*. 1987; 28:467–480. [PubMed: 3691072]
- Zanarini MC, Frankenburg FR, DeLuca CJ, et al. The pain of being borderline: Dysphoric states specific to borderline personality disorder. *Harvard Review of Psychiatry*. 1998; 6(4):201–207. [PubMed: 10370445]
- Zanarini MC, Frankenburg FR, Hennen J, et al. The McLean Study of Adult Development (MSAD): Overview and implications of the first six years of prospective follow-up. *Journal of Personality Disorders*. 2005; 19(5):505–523. [PubMed: 16274279]
- Zanarini MC, Frankenburg FR, Hennen J, et al. The longitudinal course of borderline psychopathology: 6-year prospective follow-up of the phenomenology of borderline personality disorder. *American Journal of Psychiatry*. 2003; 160(2):274–283. [PubMed: 12562573]
- Zanarini MC, Frankenburg FR, Jager-Hyman S, et al. The course of dissociation for patients with borderline personality disorder and axis II comparison subjects: A 10-year follow-up study. *Acta Psychiatrica Scandinavica*. 2008; 118(4):291–296. [PubMed: 18759803]
- Zanarini MC, Frankenburg FR, Reich DB, et al. The 10-year course of physically self-destructive acts reported by borderline patients and axis II comparison subjects. *Acta Psychiatrica Scandinavica*. 2008; 117(3):177–184. [PubMed: 18241308]
- Zanarini MC, Frankenburg FR, Reich DB, et al. Adult experiences of abuse reported by borderline patients and Axis II comparison subjects over six years of prospective follow-up. *Journal of Nervous and Mental Disease*. 2005; 193(6):412–416. [PubMed: 15920382]
- Zanarini MC, Frankenburg FR, Ridolfi ME, et al. Reported childhood onset of self-mutilation among borderline patients. *Journal of Personality Disorders*. 2006; 20(1):9–15. [PubMed: 16563075]

- Zanarini MC, Frankenburg FR, Vujanovic AA. Inter-rater and test-retest reliability of the Revised Diagnostic Interview for Borderlines. *Journal of Personality Disorders*. 2002; 16(3):270–276. [PubMed: 12136682]
- Zanarini MC, Gunderson JG, Frankenburg FR, et al. The revised diagnostic interview for borderlines: Discriminating BPD from other axis II disorders. *Journal of Personality Disorders*. 1989; 3:10–18.
- Zanarini MC, Williams AA, Lewis RE, et al. Reported pathological childhood experiences associated with the development of borderline personality disorder. *American Journal of Psychiatry*. 1997; 154(8):1101–1106. [PubMed: 9247396]

Table 1

Prevalence of major depressive disorder, any substance use disorder, post-traumatic stress disorder, self-harm, adult physical and sexual assault, affective instability, and those on SSDI in sample. Data presented as percent prevalence (*n*).

Variable	Baseline	2yr FU	4yr FU	6yr FU	8yr FU	10yr FU	12yr FU	14yr FU	16yr FU
<i>N</i>	290	275	270	264	255	249	244	238	231
Major depressive disorder	86.6% (251)	68.7% (189)	61.3% (165)	61.0% (161)	56.1% (143)	51.4% (128)	45.5% (111)	41.6% (99)	44.6% (103)
Substance use disorder	62.1% (180)	29.8% (82)	23.8% (64)	18.9% (50)	15.3% (39)	13.7% (34)	12.7% (31)	11.3% (27)	10.4% (24)
Post-traumatic stress disorder	58.3% (169)	51.3% (141)	42.4% (114)	34.8% (92)	25.5% (65)	20.9% (52)	19.3% (47)	18.5% (44)	13.9% (32)
Self-harm	90.3% (262)	50.9% (140)	35.3% (95)	28.4% (75)	22.4% (57)	17.7% (44)	23.0% (56)	18.5% (44)	14.3% (33)
Adult physical assault	33.1% (96)	16.4% (45)	13.0% (35)	12.1% (32)	10.6% (27)	6.4% (16)	5.7% (14)	5.5% (13)	5.6% (13)
Adult sexual assault	31.4% (91)	10.2% (28)	7.4% (20)	6.8% (18)	4.3% (11)	4.0% (10)	4.1% (10)	2.5% (6)	2.2% (5)
Affective instability	90.0% (261)	69.8% (192)	56.5% (152)	50.4% (133)	36.5% (93)	48.2% (120)	44.3% (108)	37.4% (89)	30.3% (70)
On SSDI	40.7% (118)	50.2% (138)	51.7% (139)	46.6% (123)	44.7% (114)	44.2% (110)	44.7% (109)	48.7% (116)	46.8% (108)

Note: SSDI = Social Security Disability Insurance

Table 2

Mean (SD) of Dissociative Experiences Scale, number of impulsive actions, and NEO-FFI scores in sample.

Variable	Baseline	2yr FU	4yr FU	6yr FU	8yr FU	10yr FU	12yr FU	14yr FU	16yr FU
<i>N</i>	290	275	270	264	255	249	244	238	231
Dissociative Experiences Scale	21.8 (18.6)	15.6 (16.5)	13.0 (14.9)	10.9 (13.8)	10.4 (13.6)	8.5 (12.1)	8.6 (12.3)	8.7 (11.2)	8.8 (12.2)
Impulsive actions	3.1 (2.0)	2.2 (1.8)	1.8 (1.5)	1.5 (1.5)	1.8 (2.0)	1.7 (1.9)	1.8 (2.2)	1.8 (2.1)	1.6 (1.9)
Neuroticism	35.1 (7.0)	29.0 (9.4)	30.6 (8.6)	29.5 (9.0)	27.8 (8.9)	28.1 (9.6)	27.4 (9.2)	27.7 (9.4)	27.5 (9.8)
Extraversion	22.6 (7.0)	23.0 (8.0)	22.5 (8.0)	23.4 (7.5)	24.1 (8.1)	23.8 (8.1)	24.0 (7.6)	23.7 (7.9)	23.5 (7.6)
Openness	29.8 (6.6)	29.8 (5.9)	29.7 (6.8)	29.6 (6.9)	29.0 (6.7)	28.3 (7.2)	29.2 (6.8)	29.4 (6.4)	29.2 (6.7)
Agreeableness	30.4 (6.7)	32.4 (7.3)	32.0 (6.2)	32.2 (6.3)	33.0 (6.1)	32.8 (6.7)	33.8 (5.9)	33.4 (6.3)	33.4 (6.2)
Conscientiousness	28.6 (7.8)	28.3 (9.9)	30.1 (7.5)	30.2 (7.6)	31.1 (7.6)	30.7 (7.9)	31.1 (7.8)	31.0 (8.1)	31.0 (7.6)

Table 3

Bivariate predictors of suicide attempts over 16 years of prospective follow-up.

Variable	Odds Ratio	z	p	95% Confidence Interval
<i>Demographic</i>				
Age	1.05	4.08	<0.001**	1.03 1.08
Sex	1.36	1.54	0.12	0.92 2.00
Race	1.05	0.27	0.79	0.72 1.54
<i>Clinical</i>				
Major depressive disorder ⁺	2.87	7.31	<0.001**	2.17 3.82
Substance use disorder ⁺	2.45	6.55	<0.001**	1.88 3.21
PTSD ⁺	3.63	8.86	<0.001**	2.73 4.82
Presence of self-harm ⁺	4.98	10.77	<0.001**	3.72 6.67
DES (units of 10) ⁺	1.04	8.05	<0.001**	1.03 1.05
Number of baseline suicide attempts	1.03	4.91	<0.001**	1.02 1.05
Number of baseline hospitalizations	1.07	6.06	<0.001**	1.05 1.09
Baseline GAF	0.95	-4.67	<0.001**	0.93 0.97
<i>Psychosocial</i>				
Childhood neglect	1.02	2.42	0.02*	1.00 1.03
Childhood sexual abuse	2.27	5.46	<0.001**	1.69 3.05
Other childhood abuse	1.02	1.74	0.08	1.00 1.05
Adult sexual assault ⁺	2.71	5.45	<0.001**	1.89 3.88
Adult physical assault ⁺	1.73	3.69	<0.001**	1.29 2.32
On SSDI ⁺	2.39	6.06	<0.001**	1.80 3.17
Caretaker suicide attempt	1.26	1.13	0.26	0.84 1.89
Caretaker suicide completion	2.65	3.09	0.002**	1.43 4.91
Caretaker self-harm	1.03	0.14	0.89	0.65 1.65
<i>Personality/Temperament</i>				
Affective instability ⁺	2.59	6.71	<0.001**	1.96 3.42
Impulsivity ⁺	1.20	5.18	<0.001**	1.12 1.29

Variable	Odds Ratio	z	p	95% Confidence Interval
Neuroticism ⁺	1.03	2.60	0.009**	1.01 1.05
Extraversion ⁺	0.97	-3.45	0.001**	0.95 0.99
Openness ⁺	0.99	-0.58	0.56	0.97 1.02
Agreeableness ⁺	1.00	-0.80	0.42	0.97 1.01
Conscientiousness ⁺	0.99	-0.80	0.42	0.97 1.01

⁺Time-varying variable,

*
p 0.05,

**
p 0.01

Note: GAF=Global Assessment of Functioning, PTSD=Post-traumatic stress disorder, DES=Dissociative Experiences Scale

Table 4
Multivariate model of significant predictors of suicide attempts over 16 years of prospective follow-up.

Variable	Odds Ratio	z	p	95% Confidence Interval
Major depressive disorder ⁺	2.09	4.67	<0.001 **	1.53 2.85
Substance use disorder ⁺	1.68	3.50	<0.001 **	1.26 2.25
PTSD ⁺	1.93	3.88	<0.001 **	1.38 2.69
Presence of self-harm ⁺	2.98	6.75	<0.001 **	2.17 4.10
Adult sexual assault ⁺	1.74	2.69	0.007 **	1.16 2.62
Caretaker suicide completion	2.94	3.55	<0.001 **	1.62 5.35
Affective instability ⁺	1.63	3.16	0.002 **	1.20 2.21
DES (units of 10) ⁺	1.02	3.08	0.002 **	1.01 1.03

⁺Time-varying variable,
* p 0.05,
** p 0.01

Note: PTSD=Post-traumatic stress disorder, DES=Dissociative Experiences Scale