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10 year outcome of suicidal behavior in Borderline Personality Disorder

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Abstract

Prospective predictors of suicide attempts were assessed in 118 subjects with BPD after 10 or more years of follow-up. Putative risk factors were assessed at baseline and reassessed at 3 months, 6 months and biannually. Mean (s.d.) time to follow-up was 14.4 (4.7) years. Subjects were predominately female (78.8%), Caucasian (81.4%) and of lower socio-economic status. Initial recruitment was evenly balanced between inpatient, outpatient and non-patient (community) sources. In the 10 year interval, 55 subjects (46.6%) attempted suicide. Compared to baseline, suicidal ideation, number of attempts, and non-suicidal self-injury diminished markedly. Core symptoms of BPD, substance and alcohol use disorders decreased significantly; however, MDD remained constant at 50%. Forty-four percent of subjects had poor psychosocial, vocational and economic outcomes. Psychosocial outcome was independent of suicide history and any treatment. Increased risk was associated with interval hospitalization prior to any attempt (illness severity), poor social, vocational, and psychosocial functioning at baseline.

Introduction

Personality disorders (PD), especially Cluster B disorders, increase the risk of suicide when co-morbid with high risk disorders such as depression, substance use and alcohol dependence (Allebeck, Allgulander, & Fisher, 1988). They are frequently associated with suicide in concert with sociodemographic risk factors such as living alone, low educational level, and adverse life events, even after adjustment for affective and substance use disorders (Schneider et al., 2008, 2006). Borderline personality disorder (BPD) is the only DSM V category defined, in part, by recurrent suicidal behavior. Among PD subjects followed prospectively over a 10 year period, BPD is uniquely associated with the risk of “ever attempting suicide” compared to all others (Ansell et al. 2015). Among BPD patients, suicide attempts are reported in 46% - 92% at first intake, with a completion rate of 3% to 10% in longitudinal studies (Black, Blum, Pfohl, & Hale, 2004). Among BPD inpatients and outpatients recruited for prospective longitudinal studies, 20–25 % attempt suicide within the first 2 years of follow-up (Yen et al., 2003, Soloff & Fabio, 2008). Most of our knowledge of suicidal behavior in BPD is derived from retrospective studies of suicide completion, or cross diagnostic studies of attempt behavior (Soloff, 2005 for review). In contrast, a prospective, longitudinal design has the advantage of using

standardized multidimensional baseline assessments, and systematic follow-ups focused on risk factors specifically relevant to suicidal behavior. We are conducting a prospective longitudinal study of suicidal behavior in BPD, seeking predictors of suicide attempts among demographic, diagnostic, clinical and socio-economic risk factors associated with suicidal behavior in prior retrospective and cross-diagnostic studies. In previous reports, we identified prospective predictors of attempt behavior at 1,2,4,6, and 8 year intervals (Soloff & Fabio, 2008, Soloff & Chiappetta, 2012a, 2017). An important finding of this longitudinal research is that risk factors associated with suicidal behavior in BPD change over time.

Time-varying risk factors present specific challenges to the clinician at each interval. An early finding of this study was that an acute Axis I disorder, MDD, was predictive of interval attempts only in the first 12 months of follow-up, despite prevalence in half of subjects through the 8 year assessment. Instead, global measures of psychosocial functioning, social and vocational achievement, and illness severity assumed prominence as consistent predictors through the 8 year interval. Frequent changes in employment and minority status were also significant predictors of interval suicide attempts in this time frame (Soloff & Chiappetta, 2017). Minority status represented multiple measures of poor socio-economic function including: lower socio-economic status, less employment, lower household income and greater reliance on government support compared to Caucasian subjects. Non-specific measures of illness severity, (such as inpatient recruitment, hospitalization in the interval prior to any attempt), were also consistent predictors. Contributions to illness severity may include interactive effects of diagnostic co-morbidities and specific personality dimensions of BPD, such as mood instability and impulsive-aggression, which were individually predictive of attempt behavior at the 8 year follow-up (Soloff & Chiappetta, 2017). However, overall measures of BPD syndrome severity or lifetime number of BPD criteria did not contribute to prediction of attempt behavior (Soloff & Chiappetta, 2017).

The long term prognosis for BPD is for symptomatic and diagnostic remission in 85% - 93% of subjects over a 10 year period (Gunderson et al., 2011; Zanarini, Frankenburg, Reich, & Fitzmaurice, 2010). The landmark McLean Study of Adult Development (MSAD) found that prevalence of interval suicide attempts among BPD subjects recruited as inpatients diminished from 20.1% at 4 year follow-up to 8.2% at the 16 year assessment (Wedig et al. 2012). Despite symptomatic and diagnostic remission for the vast majority of subjects, only 40% sustained stable functional recovery (Zanarini, Frankenburg, Reich, & Fitzmaurice, 2012). At 8 year follow-up in the current study, we found no direct relationship between poor psychosocial outcome (defined by a Global Assessment Scale score (GAS) < 61) and suicidal behavior in the interval. i.e. Suicidal behavior in the interval did not determine a poor psychosocial outcome. However, socio-economic factors such as employment, income and minority race were significant predictors of suicidal behavior in the interval.

In previous work, we proposed subtyping BPD by suicidal behavior. Using Trajectory analysis, high risk subjects were identified by a pattern of increasing medical lethality of recurrent attempts over time (Soloff & Chiappetta, 2012b). A High Lethality BPD subtype was characterized by inpatient recruitment (a measure of illness severity), poor psychosocial functioning at baseline, poor work history, and poor relationships in the immediate family. Measures of BPD psychopathology or syndrome severity were not significant characteristics

of the High Lethality subtype. A Low Lethality subtype was characterized by an attitude of negativism, histrionic and/or narcissistic PD traits, and Substance Use Disorders, a clinical presentation commonly associated with BPD. The current study assesses changes in prospective predictors of attempt behavior at 10 year follow-up, addresses the relationship of psychosocial and socio-economic risk factors to suicide attempts, and seeks to identify BPD subjects at highest risk.

Method

Participants

This study was approved by the University of Pittsburgh IRB. Male and female subjects, between the ages of 18 and 45 years, were recruited from inpatient, outpatient and non-patient (community) sources. Diagnostic interviews were conducted by Master's prepared research clinicians using standardized semi-structured interviews. These included the Structured Clinical Interview for DSM-IV-TR (SCID-I/P) for Axis I disorders, and the International Personality Disorders Examination (IPDE) for Axis II (First, Spitzer, Gibbon, & Williams, 2005; Loranger, 1999). BPD subjects were first required to meet diagnostic criteria for BPD (probable or definite) on the IPDE, with a lifetime time frame. A separate interviewer (PHS) then conducted the Diagnostic Interview for Borderline Patients (DIB), requiring a score of 7 or more (definite) for inclusion, (Gunderson, Kolb, & Austin, 1981). After 2001, the Revised Diagnostic Interview for Borderlines (DIB-r) was adopted as the primary diagnostic interview for BPD, requiring a score of 8 or more (definite) for inclusion (Zanarini, Gunderson, Frankenburg, & Chauncey, 1989). For the sake of continuity, both forms were scored concurrently. The DIB/DIB-r each have a two year timeframe. All diagnoses were confirmed in a consensus conference of raters, using a best estimate process, and all available data.

Exclusion criteria included a lifetime (past or current) Axis I diagnosis of schizophrenia, delusional (paranoid) disorder, schizoaffective disorder, any bipolar disorder or psychotic depression; clinical evidence of CNS pathology of any etiology, (including seizure disorder, acquired brain injury, or developmental deficits); physical disorders or treatments with known psychiatric consequence, or borderline MR. All subjects provided written informed consent after receiving a complete description of the study,

Measures

"Psychobiology of Suicidal Behavior in BPD" originated as a component of the Mental Health Clinical Research Center for the Study of Suicidal Behavior (MHCRC)(J.J.Mann, MD, PI). The core assessment battery of the MHCRC was adapted for the study of BPD and has been presented elsewhere (Soloff, Fabio, Kelly, Malone, & Mann, 2005). Measures from this multidimensional assessment include: 1). the MHCRC Demographic Interview; 2). diagnostic interviews (SCID-I/P, IPDE and the DIB/ DIB-r); 3). clinical state assessments (Beck Depression Inventory (BDI-II) (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961), Hamilton Rating Scale for Depression-24 item format (HamD-24) (Guy, 1976), Beck Hopelessness Scale (Beck & Steer, 1988), Global Assessment Scale (GAS) (Endicott, Spitzer, Fleiss, & Cohen, 1976)); 4). suicide scales (MHCRC Suicide History

and Lethality Rating Scale (LRS) (Oquendo, Halberstam, & Mann, 2003), Suicide Intent Scale (SIS), and Scale for Suicidal Ideation (SSI) (Beck, Beck, & Kovacs, 1975); Beck, Schuyker, & Herman, 1974), Reasons for Living Inventory (RFL) (Linehan, Goodstein, Nielson,& Chiles, 1983); 5). personality traits (Barratt Impulsiveness Scale-version-11(BIS) (Barratt, 1965; Barratt & Stanford, 1995), Buss-Durkee Hostility Inventory(BDHI) (Buss & Durkee, 1957), Life History of Aggression, adult score (LHA) (Brown & Goodwin, 1986), MMPI_Psychopathic Deviate subscale (MMPI_Pd) (Hathaway & Meehl, 1951); 6). MHCRC Family History and Abuse History (Soloff, Lynch, & Kelly, 2002); 7.) Social Adjustment Scale-self-report (SAS-sr) (Weissman & Bothwell, 1976), 8). MHCRC Treatment History. High Lethality suicide attempts were defined by a Lethality Rating Scale score ≥ 4. The MHCRC Follow-up Interview defined interval changes in demographic, diagnostic, clinical, psychosocial and treatment histories. The follow-up Axis I diagnostic interview utilized DSM-IV-TR criteria. Follow-up interviews were biannual, during which all clinical state measures, suicide, personality trait, and social adjustment assessments were repeated. In assessing economic status, the federal definition of poverty was used: i.e. For a single person household, poverty level income was $10,000, for a household of three persons, $20,000 (www.hhs.gov). For subjects at remote locations, or unable to travel, follow-up interviews were conducted by telephone, self-ratings by mail.

Statistical Analyses

Baseline variables were compared to 10 year outcomes using t-tests and McNemar's test (McNemar, 1947). If data were not available on the 10 year anniversary date, the nearest values beyond 10 yrs were used. Interval attempters were compared to non-attempters at 10 year follow-up using t-tests and Chi Square tests as appropriate. Significance for differences between groups was determined using Bonferroni correction for multiple comparisons, set at p. ≤ 0.001. (Group differences of noteworthy trends are reported for p.≤.01). Suicide attempts were defined by subjective intent to die with behavior in furtherance of suicide, and medical consequences. All attempts in this analysis had LRS scores of 2 or greater, which requires some physical consequences. Individual Cox proportional hazards models were used to examine predictive associations between pre-defined risk factors assessed at both baseline and follow-up, and suicide attempts in the interval (Table 1). Treatment variables (e.g. hospitalization, OPD treatment) were counted only "prior to any interval attempt," as medically significant suicide attempts in our setting resulted in either inpatient admission or OPD referral. "Poor" psychosocial outcome was defined by a GAS score less than 61; "good" psychosocial outcome by a GAS score of 61 or greater. The GAS score at 10-year follow-up determined "poor" vs. "good" psychosocial outcomes. "Time-to-attempt" was computed using the difference between the date of the baseline interview and the first suicide attempt in the 10-year interval (Allgulander & Fisher, 1986). Estimates of risk (odds ratio) and associated 95% confidence intervals (95%c.i.) were obtained for each analysis. All individually significant variables were entered into a final regression model.

Results

Sample Characteristics (Table 1)

118 BPD subjects who had been followed for 10 or more years were included in the analysis, drawn from a total study population of 358. Mean (s.d.) time to follow-up was 14.4 (4.7) yrs. with a range of 10 – 25 yrs. At follow-up, subjects were predominately female (78.8%), single (77.1%), and without children (67.8%). One-third were living alone. Mean (s.d.) age at follow-up was 44.2 (9.0) yrs. Participation by race mirrored the demographics of our catchment area: 81.4% Caucasian, and 18.6% minority, largely African-American. Subjects were drawn predominately from lower socio-economic classes; 65.8% were in Hollingshead Classes IV and V. They had a mean (s.d.) education of 14.1 (2.2) years. A majority (68.4%) identified with a specific religious denomination.

A prior history of psychiatric hospitalization was reported by 69.5%, with first admission at mean (s.d.) age of 22 (6.9) years. A larger number (85.7%) had received outpatient treatment, beginning at a mean (s.d.) age of 18.4 (6.9) years. Recruitment was well balanced between inpatient (32.2%), outpatient (33.9%) and non-patient community sources (33.9%).

The most prevalent Axis I co-morbidities at intake included major depressive disorder (MDD) (50.8%), substance use disorder (SUD) (32.2%), alcohol abuse or dependence (ALC) (31.4%), and post-traumatic stress disorder (PTSD) (12.7%). An additional Axis II disorder was reported by 73.6% of subjects, a second Cluster B disorder in 45.3%, with 18.9% meeting full criteria for antisocial personality disorder. The NEO Five Factor Inventory indicated high scores in Neuroticism (32.3 (9.1)) and Openness (32.3 (7.4)), using the combined gender profile for reference (Form S, adult). Scores for Extraversion (28.9 (10.4)), Agreeableness (33.1(7.0)) and Concientiousness (32.0 (9.8)) were all in the average range.

By 10 year follow-up, the prevalence of co-morbid SUD and ALC had diminished significantly, while MDD remained essentially unchanged, and PTSD minimally decreased. Scores on the observer-rated HamD-24 changed little over time, remaining in the highly symptomatic range at follow-up. Subjects endorsed less depressed mood on the self-rated Beck Depression Inventory (BDI II) ($p. = 0.004$), and the Beck Hopelessness scales ($p.= 0.024$), though falling short of significance after Bonferroni correction. Aggression (LHA) and hostility (BDHI total score) both diminished significantly over time, though not trait impulsiveness (BIS). A small but significant increase in antisocial traits (MMPIPsychopathic Deviate scale) was noted over time (Table 1).Severity of BPD criteria diminished significantly across all 5 section and total scores of the DIB, and 3 (of 4) scaled section and total scores of the DIB-r.(Only the DIB-r Cognition section score fell short of significance at $p. = 0.026$)

Many subjects came from highly dysfunctional families. A family history of alcohol abuse was highly prevalent (49.2%), as was a family history of substance abuse (33.9%). Childhood sexual abuse was reported by 47.6% of subjects, physical abuse in 41.3%. Adult sexual abuse was reported by 18.0% and adult physical abuse by 21%. A family history of

suicide was reported by only 2 subjects (1.7%), though 9 (7.6%) reported family members with suicide attempts.

Treatment utilization decreased markedly over the 10 year interval. Psychiatric hospitalization decreased from 69.5% for the time prior to baseline to 21.2% during the 10 year interval (i.e. For attempters, this was for the time prior to a first interval attempt; for non-attempters, the entire interval.) Similarly, utilization of outpatient treatment declined significantly from baseline (85.7%) to 10 year follow-up (16.1%).

Suicidal outcomes (Table 1).

At the time of intake, a past history of suicide attempt was reported by 83.1% of subjects, with a mean (s.d.) of 3.2 (4.2) attempts per attempter, and a first attempt at mean (s.d.) age of 20.3 (8.0) years. A past history of non-suicidal self injury (NSSI) was reported by 48.7%. In the 10 year interval, 55 subjects (46.6%) reported suicide attempts, a significant decrease from the attempt rate at baseline. Similarly, NSSI diminished to 21.7% at 10 year follow-up. Suicidal ideation (SSI) decreased significantly over the interval compared to baseline; however, attempt characteristics, i.e. the degree of subjective intent, objective planning, and medical lethality associated with interval attempts, was similar to that established at baseline for past attempts. Fewer subjects reported High Lethality attempts in the interval (13.6%) compared to baseline (27.1%).

In the course of the longitudinal study, there have been a total of 16 deaths, four with clear suicidal intent. Deaths by suicide involved hanging (1), and polydrug overdose with prescribed psychotropic medications (3). The mean age of suicides was 34.8 years with last research follow-ups at 3 months, 1 year, 5 years, and 9 years, respectively. Eight deaths were associated with acute drug toxicity (e.g. opiates, cocaine, alcohol) or chronic effects of alcohol abuse (alcoholic pancreatitis, end stage liver disease) at a mean age of 42.3 years. Finally, 4 subjects died of natural causes, at a mean age of 55.8 years.

Psychosocial and socio-economic outcomes (Table 1)

Overall psychosocial functioning (GAS) improved modestly but significantly from baseline to follow-up, with a 10 year mean (s.d.) of 61.2 (12.3); however, 44% of subjects still met our criterion for poor psychosocial outcome (i.e. GAS < 61).While subjects tended to report themselves as improved in overall social and vocational functioning (SAS-sr), objective vocational and economic data indicated a poor outcome for many. At 10 yr. follow-up, 43.2% were unemployed, which was not statistically different from baseline. Personal incomes, though significantly improved, remained below the Federal poverty level for 41.5% of subjects, household incomes for 35.5%, while 32.5% were dependent upon government assistance.

Attempters vs. Non-attempters (Table 2)

Interval attempters were compared to non-attempters at 10 yr. follow-up. There were surprisingly few significant differences between groups after Bonferroni correction; however, several important trends were noted. Attempters tended to be older than non-attempters, and more likely to have hospital admissions prior to any attempt. Compared to

non-attempters, significantly fewer attempters sought outpatient treatment in the interval. The two groups did not differ in severity of BPD criteria, number of BPD criteria met (IPDE), or Five Factor personality dimensions. Similarly, there was no difference between groups in co-morbidity with Axis I disorders, or measures of mood, aggression, impulsivity, or hostility. At baseline, more attempters tended to have poor psychosocial function (GAS < 61) compared to non-attempters; however, by 10 year follow-up, psychosocial outcomes, overall social and vocational adjustment (SAS-sr) did not differ between groups. Similarly, mean GAS scores at follow-up were modestly but not significantly lower among attempters. Among socio-economic indicators, attempters tended to live alone, or in households with incomes below the Federal poverty limit. (A similar trend is apparent for personal incomes). Half of interval attempters were unemployed compared to one-third of non-attempters.

Predictors of interval suicide attempts (Table 3).

Risks of an interval attempt associated with baseline and follow-up variables were examined individually using Cox regression models. Increased risk was significantly associated with non-specific measures of illness severity (e.g. hospitalization and/or OPD treatment in the interval prior to any attempt), with poor social and vocational adjustment (SAS-sr), and poor psychosocial function (GAS) at baseline. Among clinical variables, there were notable trends for baseline depressed mood (BDI-II, HamD, Hopelessness) to predict interval attempts (p. < 0.01), but not for MDD at baseline or follow-up. Similarly, there was a trend for co-morbidity with SUD, and a history of childhood sexual abuse to increase attempt risk (p. = 0.01). Suicidal ideation at baseline (SSI) was related to risk ($p \leq 0.01$), but not at follow-up. It is noteworthy that no measures of personality pathology contributed significantly to attempt risk, including severity of baseline BPD criteria (DIB/DIB-r, IPDE), impulsiveness (BIS), aggression (LHA), and the dimensional traits of the Five-Factor Inventory (NEO-FFI-3). The Reasons For Living scale, obtained at baseline, diminished attempt risk, especially the Survival Coping Beliefs subscale (p = <0.001) and the Fear of Suicide subscale (p = 0.009). At follow-up, status as a high lethality attempter, and number of high lethality attempts in the interval significantly contributed to attempt risk. (This was not true at baseline.) There were no predictive associations for Axis I co-morbidities (including MDD, SUD), mood, hostility, or aggression measures at follow-up.

A final Cox regression model examined risk of interval attempts using significant variables from the individual models. Increased risk was associated with: a.) psychiatric hospitalization in the interval, but prior to any attempt, b.) poor social and vocational adjustment at baseline (SAS-sr), and c.) poor psychosocial functioning at baseline (GAS) (Table 3).

Discussion

After 10 years, the strongest predictors of interval suicide attempts are non-specific measures of illness severity, and baseline measures of social, vocational and psychosocial functioning. They have appeared as predictors of attempt behavior in every previous analysis, though in differing measures (e.g. GAS, SAS_sr) (Soloff & Chiappetta, 2012a;

Soloff & Fabio, 2008). These risk factors also characterize a High Lethality BPD subtype (Soloff & Chiappetta, 2012a, 2017).

Illness severity is a non-specific risk factor, represented by inpatient recruitment, inpatient and outpatient treatment events in the interval occurring prior to any attempt behavior. Individual regression models suggest contributions to illness severity from co-morbid Substance Use Disorders, depressed mood, suicidal ideation, childhood sexual abuse and poor social, vocational, and psychosocial functioning. Each of these risk factors has previously been associated with suicidal behavior in BPD in retrospective and cross-diagnostic studies (Soloff, 2005, for review).

Prospective predictors of suicidal behavior change over time (Soloff & Chiappetta, 2012, 2017). Prior studies of suicidal behavior in BPD identified suicide risk factors related to core dimensions of borderline psychopathology, especially impulsivity, impulsive-aggression, affective instability and negative affectivity (Soloff, 2005, for review). In cross-diagnostic studies, impulsive-aggression increases likelihood of suicidal behavior in both depressed and non-depressed inpatients with BPD,(Soloff, Lynch, Kelly, Malone, & Mann, 2000), increases the frequency of suicide attempts (Brodsky et al. 1997), and is associated with completed suicide in subjects with BPD (McGirr et al., 2007, 2009).

Affective instability and negative affectivity are frequently associated with attempt behavior in BPD and other PD subjects (Koenigsberg et al. 2002). The Collaborative Longitudinal Personality Disorder Study (CLPDS) reported that affective instability was the strongest predictor of interval attempt behavior among PD subjects followed for 2 years; 78% of attempters were diagnosed with BPD (Yen et al. 2004). Negative affectivity (with impulsivity) was the most robust predictor of interval attempt behavior at 7 year follow-up (Yen et al., 2009). In a stress-diathesis model of suicide, impulsivity, impulsive-aggression, affective instability and negative affectivity are traits of temperament which may reflect an underlying neurobiologic diathesis to suicidal behavior at times of stress (Mann, 2003; Siever, 2008). Core BPD traits, such as negative affectivity and impulsive-aggression, were associated with increased risk of attempt in our 8 year analysis, but not after 10 years of follow-up (Soloff & Chiappetta, 2017). These core BPD traits are time-varying risk factors which diminish in severity over time (Zanarini, M. C., Frankenburg, F. R., Reich, D. B., Silk, K. R., Hudson, J. I., & McSweeney, L. B. (2007). It is unclear if remission is due to developmental maturation (“time alone”) or treatment in the interval (Zanarini et al., 2007).

Remission of BPD psychopathology over time, previously described in retrospective studies, has now been well documented in two remarkable prospective longitudinal studies. The CLPDS followed 668 treatment seeking patients, predominately, but not exclusively outpatients, diagnosed with one of 4 PDs (only 26.2% BPD), compared to an MDD/ no PD control group. (Gunderson et al., 2000). Remission of the categorical BPD diagnosis was noted in 85 % of subjects at 10 year follow-up (Gunderson et al., 2011). The McLean Study of Adult Development (MSAD), followed 290 former inpatients with BPD and also reported diagnostic remission in 93% at 10 year follow-up (Zanarini, M. C., Frankenburg, F. R., Reich, D. B., & Fitzmaurice, G. (2010). It is important to note that remission based on categorical DSM and DIB-r diagnoses is a statistical construct and does not imply

sustained improvement or psychosocial recovery (defined as remission with good social and vocational functioning.) Acute symptoms in BPD wax and wane as situational stressors act upon chronic personality vulnerabilities. At 10 year follow-up in the MSAD study, 30% of patients who had achieved remission for 2 years subsequently experienced a recurrence, 34% of patients who had recovered lost their psychosocial recovery (Zanarini, Frankenburg, Reich, & Fitzmaurice, 2010). We suggest that sustained remission depends, in part, on diminished temperamental vulnerability to negative life events, as well as enhanced coping skills.

Both CLPDS and MSAD studies addressed suicidality, though it was not a primary aim of either study. Choice of suicide risk factors was opportunistic and did not include characteristics of attempt behavior, or measures specific for suicide risk (e.g. SSI, SIS, RFL). Among BPD subjects in the CLPDS, 20.5% attempted suicide in the first 2 years of follow-up, similar to our own 2 year experience of 24.8% interval attempters (Yen et al. 2003, Soloff & Fabio, 2008). Among all subjects in the CLPDS sample, a baseline diagnosis of BPD, and substance use disorder predicted attempts in the 2 year interval. Worsening of MDD, drug or alcohol use, predicted a suicide attempt in the ensuing month. The presence of MDD also predicted attempt behavior in the first year of our study, though not in following years (Soloff & Fabio, 2008). Using all study participants, the 2 year CLPDS report also found that affective instability, female gender, and a childhood history of sexual abuse predicted attempts (Yen et al 2003). At 3 year follow-up, assessing only PD subjects, negative life events (involving love/ marriage and crime/ legal events) were associated with interval attempts (Yen et al. 2005). At 7 years, negative affectivity, and lack of premeditation (impulsivity) predicted interval attempts in a sample which included all study participants (Yen et al. 2009).

The MSAD study assessed predictive associations of baseline characteristics of BPD subjects with interval suicide attempts at 16 year follow-up (Wedig et al. 2012). Though severity and significance of risk factors varies over time, time-varying risk factors were not reassessed at follow-up in this analysis. A final multivariate model found significant associations between interval attempt behavior and baseline MDD, SUD, PTSD, self harm, adult sexual assault, caretaker suicide, affective instability, and severe dissociation.

Comparisons between these studies and our own are made difficult by the important sample and method differences noted above. Nonetheless, there are some noteworthy overlapping results. Our study noted the importance of co-morbid MDD as a predictor of attempt behavior in the first year of follow-up, impulsivity and negative affectivity at the 8 year follow-up, SUD and childhood sexual abuse at 10 years.

Time-varying risk factors were assessed at each follow-up in our study. One consequence of the progressive remission of BPD symptoms over time, was the paucity of significant differences between interval attempters and non-attempters at 10 year follow-up. Differences between groups were primarily related to severity of baseline risk factors. Contrary to expectation, attempters did not differ from non-attempters in severity of BPD criteria, personality traits, or Axis I co-morbidity. Instead, they tended to have more non-specific illness severity, poor psychosocial and socio-economic function at baseline, reflecting

predictors of interval attempts identified in the final regression model. We found no significant relationship between suicidal behavior and psychosocial outcome at 10 year follow-up, i.e. a favorable outcome could still result despite a history of suicidal behavior.

Poor psychosocial functioning and low levels of social adjustment are related to attempt behavior, high lethality attempts, and suicide completion in BPD (Kelly, Soloff, Lynch, Haas, & Mann, 2000; Soloff, 2005). Many retrospective studies have detailed the social and vocational impairment of suicides with BPD (and other PDs) (Paris & Zweig-Frank, 2001, Heikkinen et al., 1997, Runeson & Beskow, 1991, Runeson, Beskow, & Waern, 1996). In a retrospective survey of suicide among BPD patients 27 years after hospital discharge, Paris & Zweig-Frank (2001) reported that years of illness, loss of supportive relationships, and social isolation were prominent risk factors for suicide. Recent life events, interpersonal loss and conflict, job problems and unemployment were significantly associated with death by suicide in an epidemiological study of PD subjects (61% Cluster B), compared to non-PD suicides (Heikkinen et al., 1997). Unemployment, poor social integration and poor psychosocial functioning are well known risk factors for suicide across diagnoses, and in non-clinical populations (Kposowa, 2001; Duberstein et al., 2004, Angst & Clayton, 1998; Angst et al., 2014). At 10 year follow-up, the mean GAS score for subjects in our study was only 61.2, very close to the definition of poor psychosocial outcome (GAS < 61.) Similarly, the CLPDS reported a mean GAF of 57 at 10 year follow-up (Gunderson et al.2011). The MSAD reported psychosocial recovery in only 50%, defined by remission of diagnosis, good social and vocational functioning, and a GAF ≥ 61 (Zanarini, M. C., Frankenburg, F. R., Reich, D. B., & Fitzmaurice, G.M. (2010b).

At 10 year follow-up in the MSAD study, poor vocational attainment, and not social adjustment, contributed most to poor psychosocial outcomes (Zanarini, M. C., Frankenburg, F. R., Reich, D. B., & Fitzmaurice, G. M. (2010b). Even among subjects who started the study with good psychosocial functioning, a large majority (87%) lost good functioning by 10 year follow-up. The primary cause for loss of previously good psychosocial functioning (in 77.6% of cases) was loss of vocational achievement. In the CLPDS, 64% of BPD subjects were unemployed at the 10 year assessment, more than other PD comparison groups (Gunderson et al. 2011). Our subjects reported no significant changes in social relationships; however, more attempters (43.6%) reported living alone, compared to non-attempters (25.4%). Vocational impairment was manifested across multiple measures, including high rates of unemployment, household incomes at poverty level, and continued dependence on government support. At 10 year follow-up, 32.5% of our subjects were receiving some government assistance (up from 26.7% at baseline), somewhat less than the 44% who were receiving SSDI in the 10 year MSAD analysis (Zanarini, Jacoby, Frankenburg, Reich, & Fitzmaurice, 2009). Educational and vocational deficits associated with years of acute illness early in life may contribute to these poor socio-economic outcomes, and, thereby to long term risk of suicidal behavior in BPD.

Symptomatic and diagnostic improvement in BPD is necessary but not sufficient to produce functional recovery. The important contribution of Axis I co-morbidity, especially MDD, to poor psychosocial outcome was reported in our 8 year follow-up, where MDD was the only risk factor predictive of poor psychosocial outcome (Soloff & Chiappetta, 2012b).

The prevalence of MDD remained unchanged in half of subjects over 10 years, despite widespread participation in treatment. As this was not designed as a treatment study, it was not possible to assess treatment effectiveness. Nonetheless, psychosocial outcomes, assessed as “good” (GAS ≥ 61) vs. “poor” (GAS< 61), or, as a change in GAS from baseline to follow-up, were statistically independent of treatment received in the interval.

Affective symptoms of BPD, including depressed mood, are among the most refractory to change over time (Zanarini et al. 2003; Zanarini et al., 2007). The refractoriness of MDD among borderline patients begs the question of whether characterologic features of the disorder (such as negative affectivity, low self-esteem and rejection sensitivity), confound the diagnosis of MDD on structured interviews. An older literature described “characterologic depression” in patients with BPD, reflecting long-standing negative attitudes about the self. These attitudes are relatively refractory to pharmacotherapy, and indicate a need for psychotherapeutic intervention (Soloff, Cornelius, & George,1991).

The persistence of MDD may have an adverse effect on attaining and maintaining employment, and on workplace productivity. Workplace productivity is a significant predictor of long term remission in MDD (Jha et al., 2016). Work-focused interventions (e.g. “job coaching”) have been effective as adjunctive treatments in improving work outcomes for employed dysthymic subjects (Hees et al. 2013, Adler et al. 2015) and may have relevance as an adjunctive treatment for depressed subjects with BPD. Although vocational rehabilitation programs have been proposed in the past for patients with BPD, such programs have not been widely implemented (Links, 1993).

Suicidal behavior diminished markedly over the 10 year interval across multiple indicators. Frequency of attempts dropped from 83.1% of subjects at baseline to 46.6% at follow-up; self injury from 48.7% at baseline to 21.7% at follow-up. Zanarini et al (2008) also reported decreased suicidal behavior for the inpatient MSAD sample at 10 year follow-up. A baseline history of suicide attempt diminished from 79% at baseline to less than 13 % at 10 year follow-up; self-mutilation from 90% at baseline to less than 18 % over the 10 year period (Zanarini et al., 2008). Zanarini et al (2008) suggested that the decline in suicidal behavior may be due to effects of treatment or maturation (time alone). It is likely that diminished intensity in personality trait vulnerabilities, especially in impulsive-aggression and negative affectivity, mediate this favorable outcome.

Our longitudinal study confirms core findings of the CLPDS and MSAD studies in regard to the long term outcome of BPD. A majority of subjects will experience diagnostic remission and symptomatic improvement over 10 years time; however, many will not attain functional recovery in terms of psychosocial, vocational and economic achievement. At 10 year follow-up, 44% of subjects in our study had poor psychosocial outcomes, with unemployment, poverty-level incomes, and reliance on government assistance. Long term psychosocial outcome for these subjects resembles that for other serious and persistent mental illnesses. Empirical evidence from all three studies strongly supports an additional focus on educational and vocational rehabilitation for BPD in order to mitigate poor psychosocial outcomes and risk of suicidal behavior in the long term.

Limitations

The absence of clinical comparison groups limits generalization of our findings. Similarly, our analyses are limited to volunteer subjects who continued participation for 10 or more years. To address this issue, we compared the 118 10-year subjects with the remaining subjects in the database on all baseline variables. After Bonferroni correction (at p. <0.001), subjects in the 10 year sample were older, had lower GAS scores, and were more often suicide attempters. This suggests greater baseline impairment among subjects who remained in the study for 10 or more years; however, the long term outcome for these co-operative subjects in terms of illness severity, social and vocational achievement, may differ from those who dropped out of the study.

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Table 1.

Risk factors from baseline to 10 year follow-up

A. Demographic	Baseline	FU	Stat, p-val (!)
Age (@ long term FU)	29.54 ± 7.91	44.2 ± 9.0	t(1)=34.13, <0.001
Married (% no)	78.0	77.1	McN(1)=0.80, 1.00
Children (% none)	71.2	67.8	McN(1)=2.25, 0.134
B. Socio-economic changes			
SES (% Hollingshead Cl. IV,V)	65.8	57.6	McN(1)=1.42, 0.233
Lives Alone (% yes)	25.4	33.9	McN(1)=2.13, 0.143
Source of Income (% on gov't. support)	26.7	32.5	McN(1)=0.83, 0.361
Household Income (% <20K)	59.8	35.5	McN(1)=13.1, <0.001
Patient Personal Income (% <10K)	68.6	41.5	McN(1)=13.6, <0.001
Employed (% yes)	47.5	56.8	McN(1)=2.13, 0.145
Social Adjustment Scale (SAS-SR) total	2.53 ± 0.55 (106)	2.34 ± 0.63 (62)	t(54)=2.48, 0.016
Work (102/61)	1.52 ± 1.05	2.14 ± 0.84	t(52)=2.28, 0.027
Social (105/61)	2.83 ± 0.74	2.69 ± 0.88	t(52)=1.91, 0.062
External Family (106/59)	2.35 ± 0.68	2.26 ± 0.81	t(51)=0.69, 0.492
Marital (39/25)	2.51 ± 0.48	2.24 ± 0.66	t(13)=0.63, 0.540
Parental (16/22)	1.88 ± 0.86	1.72 ± 0.63	t(4)=0.53, 0.625
Family Unit (67/44)	2.63 ± 0.95	2.48 ± 1.08	t(29)=1.38, 0.179
C. Treatment History			
Psychiatric hospitalization*	69.5	21.2	z=7.45, p<0.001
Outpatient Treatment*	85.7	16.1	z=10.69, p<0.001
D. Diagnostic Variables			
Major Depressive Disorder (MDD)	50.8	50.0	McN(1)=0.00, 1.00
Substance use Disorder (SUD)	32.2	11.4	McN(1)=15.6, <0.001
Alcohol abuse/dependence (ALC)	31.4	8.8	McN(1)=18.6, <0.001
Post-Traumatic Stress Disorder (PTSD)	12.7	9.6	McN(1)=0.45, 0.503
E. Clinical State Variables			
Beck Depression Inventory (101/68)	26.16 ± 12.58	18.21 ± 12.69	t(50)=3.03, 0.004
Hamilton Depression (HamD) (115/114)	20.94 ± 8.22	18.54 ± 11.93	t(110)=1.49, 0.139

A. Demographic	Baseline	FU	Stat, p-val (!)
Beck Hopelessness Scale (115/53)	11.75 ± 6.01	8.72 ± 5.88	t(51)=2.32, 0.024
Global Assessment Scale (GAS)	51.97 ± 12.23	61.42 ± 12.19	t(114)=6.81, <0.001
Poor psychosocial function (%GAS<61)	72.6	44.0	McN(1)=19.5, <0.001
F. Suicidal Behavior			
Suicide Attempt (%Yes)	83.1	46.6	McN(1)=36.0, <0.001
Suicide Intent Scale (SIS)			
Total Score, Max Lethality	15.16 ± 5.92	16.00 ± 6.16	t(16)=0.74, 0.468
Total Score, Most Recent Attempt	14.34 ± 6.28	15.90 ± 5.27	t(16)=0.77, 0.451
Lethal Intent Factor, Max lethality	8.4 ± 3.5	8.9 ± 3.6	t(16)=0.79, 0.439
Lethal intent Factor, Most recent	7.7 ± 3.6	8.7 ± 3.0	t(16)=0.39, 0.700
Planning Factor, Max lethality	6.4 ± 3.2	7.0 ± 3.3	t(16)=1.01, 0.327
Planning Factor, Most recent	6.3 ± 3.6	7.0 ± 2.9	t(16)=0.27, 0.788
Scale for Suicidal Ideation (SSI)			
Prior 2 Weeks	12.20 ± 11.53	2.84 ± 5.58	t(95)=7.23, <0.001
Current	6.54 ± 8.76	1.92 ± 4.35	t(87)=4.93, <0.001
Number of attempts (BL vs. interval)	3.16 ± 4.21	1.47 ± 3.02	t(117)=4.29, <0.001
History of Non-suicidal self-injury	48.7	21.7	McN(1)=15.0, <0.001
Lethality Rating Scale (LRS)(max. score)	3.09 ± 1.74	3.08 ± 1.60	t(97)=0.09, p=0.93
High Lethality attempter (LRS≥4) (% yes)	27.1	13.6	McN(1)=7.03, 0.007
Number of high lethal attempts (LRS ≥ 4)	0.47 ± 0.92	0.28 ± 0.83	t(117)=1.95, 0.053
G. Personality traits			
Aggression, Adult only (Brown-Goodwin LHA)	24.05 ± 6.46	14.85 ± 3.85	t(74)=11.29, <0.001
Barratt Impulsiveness Scale (BIS)	75.16 ± 4.51	74.78 ± 4.72	t(97)=0.81, 0.418
Buss-Durkee Hostility Inventory (BDHI)	45.52 ± 11.41	33.77 ± 16.05	t(44)=4.38, <0.001
Assault	4.65 ± 2.77	3.71 ± 2.90	t(44)=2.02, 0.05
Indirect Hostility	5.64 ± 1.82	4.15 ± 2.11	t(44)=3.74, 0.001
Irritability	7.85 ± 2.28	5.58 ± 3.30	t(44)=3.81, <0.001
Negativism	2.99 ± 1.46	2.13 ± 1.51	t(44)=3.80, <0.001
Resentment	5.32 ± 2.01	3.62 ± 2.55	t(44)=3.25, 0.002
Suspicion	5.86 ± 2.39	3.94 ± 3.18	t(44)=2.85, 0.007
Verbal Hostility	7.79 ± 3.13	6.67 ± 3.33	t(44)=1.23, 0.226
Guilt	5.41 ± 2.05	4.35 ± 2.19	t(44)=2.34, 0.024
MMPI Psychopathic Deviate Subscale	59.23 ± 6.72	62.49 ± 7.26	t(77)=4.28, <0.001

A. Demographic	Baseline	FU	Stat, p-val (!)
DIB Section Score Total	27.65 ± 4.22	15.63 ± 6.90	t(51)=11.35, <0.001
Social Adaptation	4.81 ± 1.61	3.87 ± 1.65	t(51)=3.65, 0.001
Impulse Action Patterns	7.21 ± 2.03	3.04 ± 2.77	t(51)=9.50, <0.001
Affects	6.38 ± 1.30	3.98 ± 2.30	t(51)=6.94, <0.001
Psychosis	2.90 ± 2.28	1.50 ± 1.64	t(51)=3.75, <0.001
Interpersonal relations	6.35 ± 2.27	3.25 ± 2.65	t(51)=7.50, <0.001
DIB-R Scaled Section Score	8.38 ± 1.26	3.97 ± 3.17	t(31)=8.58, <0.001
Affect	9.06 ± 1.32	6.53 ± 2.77	t(31)=4.83, <0.001
Cognition	2.97 ± 1.84	1.84 ± 2.16	t(31)=2.34, 0.026
Impulse Action Patterns	7.22 ± 1.79	3.00 ± 2.64	t(31)=7.76, <0.001
Interpersonal Relationships	9.03 ± 2.65	4.28 ± 3.54	t(31)=7.37, <0.001

(!) McN = McNemar Test, statistic is a Chi-Square test, when value not reported, binomial distribution (z) was used.

* At baseline, psychiatric hospitalization and outpatient treatment is reported for “% yes ever prior to baseline.” For FU, these are reported as “% yes prior to first attempt in interval, since baseline.”

Table 2.

COMPARISONS BETWEEN INTERVAL ATTEMPTERS AND NON-ATTEMPTERS AT 10 YR FOLLOW-UP

A. Demographic Variables	**Non Attempter (n=63)**	**Attempter (n=55)**	**Stat,p**
Age (@ most recent FU)	42.3 ± 9.1	46.4 ± 8.3	t=2.4, df=116, p=0.012
Education (@ baseline, # years FT)	14.3 ± 2.4	13.9 ± 2.1	t=0.87, df=115, p=0.39
Sex (% female)	74.6	83.6	χ^2=1.4, df=1, 0.23
Source of Recruitment			χ^2=5.2, df=2, 0.08
Inpatient	23.8	41.8	
Outpatient	34.9	32.7	
Non-patient	41.3	25.5	
Race (% Caucasian)	85.7	76.4	χ^2=1.7, df=1, p=0.19
Religion (% none)	31.7	31.5	χ^2=0.001, df=1, p=0.98
Married (% no)	81.0	72.7	χ^2=1.13, df=1, p=0.29
Children (% none)	68.3	67.3	χ^2=0.01, df=1, p=0.91
B. Socio-economic			
Hollingshead SES (% low)	50.8	65.5	χ^2=2.6, df=1, p=0.11
Lives Alone (% yes)	25.4	43.6	χ^2=4.4, df=1, p=0.04
Major Source of Income (% Government)	27.4	38.5	χ^2=1.6, df=1, p=0.21
Household Income (% <20K)	24.1	49.0	χ^2=7.2, df=1, p=0.007
Patient Personal Income (% poverty - <10K)	33.3	50.9	χ^2=3.7, df=1, p=0.053
Change in Employment (%yes)	73.0	72.7	FET=0.87, p=1.00
Employed (%no, from occupation)	33.3	54.4	χ^2=5.4, df=1, p=0.02
*Hospitalization (%yes before att)	38.1	45.5	χ^2=0.66, df=1, p=.042
*Outpatient Treatment (% yes before att)	87.3	34.5	χ^2=34.95, df=1, p<0.001
C. Treatment History			
*Hospitalization (%yes before att)	38.1	45.5	χ^2=0.66, df=1, p=.042
*Outpatient Treatment (% yes before att)	87.3	34.5	χ^2=34.95, df=1, p<0.001
D. Diagnostic Variables			

A. Demographic Variables	Non Attempter (n=63)	Attempter (n=55)	Stat,p
MDD	46.7	53.7	χ^2=0.56, df=1, p=0.45
Substance	10.0	13.0	χ^2=0.25, df=1, p=0.62
Alcohol	8.3	9.3	FET, p=1.00
PTSD	8.3	11.1	χ^2=0.25, df=1, p=0.62
BDI	18.0 ± 12.5	18.4 ± 13.1	t=0.13, df=66, p=0.90
Aggression, (LHA)	14.8 ± 3.9	14.9 ± 3.8	t=0.16, df=77, p=0.87
Impulsivity (BIS)	74.9 ± 4.6	74.7 ± 4.9	t=0.19, df=107, p=0.85
Hostility (Buss-Durkee)	34.5 ± 17.0	33.1 ± 15.4	t=0.31, df=50, p=0.76
HRSD	18.5 ± 10.6	18.6 ± 13.5	t=0.05, df=95.6, p=0.96
Hopelessness	9.0 ± 6.2	8.4 ± 5.6	t=0.4, df=51, p=0.69
SAS-SR	2.3 ± 0.6	2.4 ± 0.7	t=0.55, df=60, p=0.58
Poor Psychosocial Outcome, 10YR (% GAS<61)	37.7	50.9	χ^2=2.0, df=1, p=0.15
Poor Psychosocial Outcome, BASELINE (% GAS<61)	61.9	85.2	χ^2=7.9, df=1, p=0.005
E. Personality Traits			
IPDE # Borderline Criteria Met	5.75 ± 1.11	5.30 ± 1.38	t=1.97, df=113, p=0.051
MMPI Psychopathic Deviant Subscale	61.98 ± 6.87	63.14 ± 7.76	t=0.79, df=97, p=0.44
DIB-R Total	3.06 ± 2.79	5.04 ± 3.30	t=2.45, df=55, p=0.02
Affect	5.35 ± 3.08	6.96 ± 3.26	t=1.91, df=55, p=0.06
Cognition	1.45 ± 2.05	2.77 ± 2.22	t=2.33, df=55, p=0.02
Impulse Action Patterns	2.13 ± 2.25	3.46 ± 2.93	t=1.90, df=46.3, p=0.06
Interpersonal Relationships	4.10 ± 3.63	5.62 ± 3.97	t=1.51, df=55, p=0.14
NEO – Neuroticism	31.78 ± 9.06	32.89 ± 9.35	t=0.46, df=57, p=0.65
NEO Extraversion	29.59 ± 10.56	28.04 ± 10.38	t=0.57, df=57, p=0.57
NEO - Openness to Experience	34.38 ± 6.27	31.93 ± 8.50	t=1.27, df=57, p=0.21
NEO - Agreeableness	33.97 ± 5.63	32.04 ± 8.32	t=1.06, df=57, p=0.29
NEO Conscientiousness	33.81 ± 8.79	32.00 ± 10.99	t=0.70, df=57, p=0.48

*Hospitalization and Outpatient were re-coded so that for attempters, it reflects the interval from B→1st attempt in FU, for non-attempters, B→most recent visit

Table 3a.

Predictors of Increased Risk: Baseline and Follow-up Risk Factors (Individual Cox Regression Models)

A. BASELINE			
Risk Factor	**RR**	**95% CI**	**p-value**
Any Substance Use Disorder	2.007	1.171–3.440	0.01
Beck Depression Inventory	1.037	1.013–1.063	0.003
Hamilton Depression (HamD)	1.051	1.017–1.085	0.003
Beck Hopelessness Scale	1.070	1.018–1.123	0.007
Global Assessment Scale (GAS)	0.943	0.919–0.968	<0.001
Poor psychosocial function (%GAS<61)	2.729	1.285–5.794	0.009
Social Adjustment Scale (SAS-SR)	2.851	1.681–4.835	<0.001
SAS-SR Work	1.379	1.085–1.752	0.009
SAS-SR Social	1.891	1.262–2.834	0.002
History of child sexual abuse	2.149	1.191–3.877	0.01
Scale for Suicidal Ideation			
Prior 2 weeks	1.031	1.006–1.056	0.01
Current	1.042	1.012–1.073	0.009
Reasons for Living Total Score (Protective)	0.988	0.981–0.995	0.001
RFL mean item score	0.577	0.413–0.806	0.001
RFL Survival Coping Beliefs	0.569	0.426–0.759	<0.001
RFL Fear of Suicide	0.680	0.509–0.908	0.009
B. FOLLOW-UP			
High Lethality attempter status	5.354	2.883–9.941	<0.001
Number of High Lethality attempts	1.839	1.471–2.299	<0.001
Any outpatient Treatment over FU	2.232	1.209–4.123	0.010
Psych Hospitalization in interval before attempt	4.442	2.543–7.759	<0.001
Any Outpatient Tx. In interval before attempt	3.127	1.767–5.533	<0.001

Table 3b.

Predictors of Increased Risk : Final Cox Regression Model

Risk Factor	RR	95% CI	p-value
Psychiatric hospitalization in interval	3.42	1.86–6.30	<0.001
(Higher) SAS Overall score @ BASELINE	2.18	1.3–3.66	0.003
(Poor) Global Assessment Score @ BASELINE	0.96	0.92–0.99	0.007

Bonferroni correction for individual models p. ≤0.001, trends shown for p. ≤ 0.01