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Antisocial Personality Disorder and Borderline Symptoms are Differentially Related to Impulsivity and Course of Illness in Bipolar Disorder

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Abstract

Background—Interactions between characteristics of bipolar and Axis II cluster B disorders are clinically and diagnostically challenging. Characteristics associated with personality disorders may be dimensional aspects of bipolar disorder. We investigated relationships among antisocial personality disorder (ASPD) or borderline personality disorder symptoms, impulsivity, and course of illness in bipolar disorder.

Methods—Subjects with bipolar disorder were recruited from the community. Diagnosis was by Structured Clinical Interview for DSM-IV (SCID-I and –II), psychiatric symptom assessment by the Change version of the Schedule for Affective Disorders and Schizophrenia (SADS-C), severity of axis II symptoms by ASPD and borderline personality disorder SCID-II symptoms, and impulsivity by the Barratt Impulsiveness Scale (BIS-11).

Results—ASPD and borderline symptoms were not related to clinical state or affective symptoms. Borderline symptoms correlated with BIS-11 impulsivity scores, and predicted history of suicide attempts independently of the relationship to impulsivity. ASPD symptoms were more strongly related to course of illness, including early onset, frequent episodes, and substance-related disorders. These effects persisted after allowance for gender and substance-use disorder history.

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Conclusions—Personality disorder symptoms appear to be dimensional, trait-like characteristics of bipolar disorder. ASPD and Borderline symptoms are differentially related to impulsivity and course of illness.

Keywords

bipolar disorder; personality disorders; borderline personality disorder; antisocial personality disorder; comorbidity; impulsive behavior; substance-related disorders; recurrence; sex factors

1. Introduction

The diagnostic boundaries of bipolar disorder are problematic. Cluster B personality disorders, including antisocial personality disorder (ASPD) and borderline personality disorder, share core features of impulsivity and affective instability with bipolar disorder (Fan et al., 2008; Henry et al., 2001). Cluster B disorders could be part of a broad bipolar spectrum (Perugi et al., 2002), representing an attenuated form of bipolar disorder, as suggested by Kraepelin (Kraepelin, 1921). Alternatively, characteristics of cluster B personality disorders could combine with other aspects of bipolar disorder in a dimensional manner, potentially representing a more complicated form of the illness, with increased impulsivity (Dunayevich et al., 2000; Henry et al., 2001; Swann et al., 2009b). For example, one study suggested that most patients with borderline personality disorder also met criteria for bipolar disorder (Deltito et al., 2001). However they are related, characteristics associated with cluster B personality disorders in patients with bipolar disorder result in diagnostic difficulties and high social cost.

a. Impulsivity in bipolar and cluster B disorders

The high reported comorbidity of bipolar disorder and cluster B personality disorders (Fan et al., 2008; Gunter et al., 2008; Wilson et al., 2007) may be related to a shared component, such as impulsivity. One study found that trait impulsivity was mutually increased in bipolar disorder and borderline personality disorder compared to individuals with only one of these diagnoses (Wilson et al., 2007). Potential impulsivity-related complications of bipolar disorder, including alcohol or substance use disorders (Kay et al., 1999; Kay et al., 2002; Swann et al., 2004), suicidal behavior (Garno et al., 2005; Swann et al., 2005), and criminal behavior (Mueser et al., 2006) may be more likely if a concurrent personality disorder is present. These characteristics are consistent with increased impulsivity, but there is little direct evidence for this relationship. Further, characteristics associated with a personality disorder are not the same as the personality disorder itself, and may have either different or shared mechanisms across diagnostic entities.

Bipolar disorder resembles ASPD and borderline personality disorder in many respects (Mueser et al., 2006). Bipolar disorder and borderline personality disorder share propensities for affective instability and impulsivity (Akiskal, 2004; MacKinnon et al., 2006). One study found that 44% of over 600 subjects with borderline personality disorder also met strict diagnostic criteria for bipolar I or II disorder (Deltito et al., 2001). Bipolar disorder is associated with higher rates of arrest and incarceration (Calabrese et al., 2003), and higher prevalence among incarcerated individuals, than community controls (Brinded et al., 2001; Kemp et al., 2008). Early onset of bipolar disorder is associated with juvenile antisocial behavior (Barzman et al., 2007) and greater likelihood of arrest (Gillberg et al., 1993). A 13-year prospective study found increased likelihood of subsequent arrest in a nonclinical sample of adolescents with high hypomania scores (Kwapil et al., 2000).

Personality disorders or their characteristics may be associated with a more severe or unstable course of bipolar disorder (Dunayevich et al., 2000; Garino et al., 2005; Henry et al.,

2001; Kay et al., 2002). Individuals with bipolar disorder who had been arrested had more hospitalizations than those who had not (Quanbeck et al., 2005) and were more likely to be experiencing manic symptoms (Quanbeck et al., 2004). These findings could reflect impulsivity or more severe mood instability as characteristics of cluster B personality disorder superimposed on bipolar disorder, or characteristics of bipolar disorder itself that resemble those of a personality disorder.

We reported that, among subjects with ASPD, there was a significant correlation between number of ASPD symptoms and impulsive errors on a test of response inhibition (Swann et al., 2009c). Cluster B personality disorders may therefore represent dimensional characteristics that can combine with other disorders, rather than discrete categorical entities. Not much is known about the specificity of relationships between impulsivity and specific cluster B disorders. It has been suggested, for example, that ASPD and borderline personality disorders are analogous disorders expressed differently according to gender (Looper et al., 2000; Paris, 1997). Yet, there is little information about the manner in which ASPD and borderline personality disorder traits may interact, or about their specific interactions with bipolar disorder.

b. Rationale and hypotheses

We investigated relationships among severity of personality disorder characteristics, measured as ASPD or borderline personality disorder SCID-II symptom counts, course of illness, and impulsivity in subjects with bipolar disorder. Our hypotheses were that 1) ASPD and borderline personality disorder symptoms would be related to clinical state and impulsivity, 2) ASPD and borderline personality disorder symptoms would be related to course of illness including recurrence and comorbid disorders, and 3) if ASPD and borderline personality disorder characteristics are analogous conditions in men and women, one would expect that ASPD symptoms would be related to impulsivity and illness course in men, while borderline personality disorder symptoms would have this relationship in women.

2. Methods

a. Subjects

Potential participants, referred by clinicians or responding to advertisements, were fully informed of the procedures, risks, and benefits of the study, and signed informed consent documents, before any study-related procedures took place. The study was approved by the Committee for the Protection of Human Subjects, Institutional Review Board (IRB) for the University of Texas Health Science Center at Houston. Subjects were required to have negative breath alcohol and urine screens for drugs of abuse when they were tested.

All subjects had bipolar disorder, and had at least one symptom of ASPD or borderline personality disorder from the SCID-II. Of the 55 subjects, 14 did not meet criteria for an Axis II disorder (8 men and 6 women); 35 met criteria for ASPD (20 men and 15 women), 23 (8 men and 15 women) met criteria for borderline personality disorder, and 17 (7 men and 10 women) met criteria for both disorders. Four met criteria for bipolar II disorder; the rest had bipolar I disorder; subjects with bipolar-I vs bipolar II disorders did not differ in ASPD or borderline personality disorder symptoms, BIS-11 scores, or total episodes of illness (Student *t* or Mann-Whitney test, $p > 0.06$).

As noted below, subjects were allowed to have histories of a drug or alcohol use disorder, and most did. However, to avoid interference with tests in the current study, subjects were required to have negative urine drug screens and breathalyzer tests when they were studied, and not to have met criteria for an active substance-use disorder for at least one month.

Course of illness for subjects with bipolar disorder was determined using a life chart of episodes based on the SCID. The median age of onset was 17 (25th–75th percentile 13–22). Distributions of numbers of episodes could not be normalized; further, as the number of episodes increases, the accuracy of determining their exact number is likely to decrease. Therefore, we either used nonparametric statistics or categorized the number of episodes. For manic/hypomanic episodes, 16 subjects had fewer than 10 episodes; the median number of episodes was too many to count (in 32 subjects). For depressive episodes, 21 subjects had fewer than ten, and the median number of depressive episodes was too many to count (in 26 subjects). For total episodes, nine subjects had fewer than ten; the median was too many depressive or manic episodes to count plus at least 3 episodes of the other polarity. Twenty subjects had too many depressive and too many manic episodes to count. Twenty subjects had predominately manic episodes, 8 predominately depressive, and in 27 neither depressive nor manic episodes predominated. Forty-two subjects had histories of substance use disorders while 17 did not; 29 had histories of alcohol use disorders, 37 stimulant use disorders, and 24 had both. Twenty-nine had made suicide attempts while 20 had not. Numbers varied according to availability of information.

b. Diagnosis and clinical state

Diagnoses, including substance abuse or dependence, were rendered by the Structured Clinical Interview for DSM-IV (SCID) (First et al., 1996). Symptoms were rated using the Change version of the Schedule for Affective Disorders and Schizophrenia (SADS-C), designed to measure depressive, manic, anxiety, and psychotic symptoms concomitantly (Spitzer et al., 1978b). We used the augmented version of the SADS-C (Bowden et al., 1994), including all ten mania rating scale items from the full SADS (Spitzer et al., 1978a), rather than the subset of five items in the conventional SADS-C (Spitzer et al., 1978b).

Severity of cluster B disorder was assessed using the number of ASPD or borderline personality disorder lifetime symptoms endorsed (SCID-II (First et al., 1997)); structured interviews have been reported to produce more reliable measures of personality disorder severity than questionnaires (Fogelson et al., 1991) and symptom counts appear to be a useful measure of overall severity (Mattei et al., 1997). In the subset of patients endorsing any ASPD or borderline personality disorder symptoms, for whom the correlational and logit analyses are reported, ASPD symptoms ranged from 0–16 and borderline from 0–8.

Raters were trained in these instruments, using standard rating tapes and materials. Diagnoses and histories were confirmed in consensus meetings that included co-authors A. C. S, F. G. M., and/or J. L. S.

c. Impulsivity

Impulsivity was assessed using the Barratt Impulsiveness Scale (BIS-11) (Barratt et al., 1983; Stanford et al., 2009), a 30-item self-rated scale with three oblique factors: attentional/cognitive, measuring toleration for cognitive complexity and persistence; motor, measuring the tendency to act on the spur of the moment; and nonplanning impulsivity, measuring the lack of sense of the future (Patton et al., 1995). Impulsivity as measured by the BIS-11 is considered “trait-like” because the questionnaire focuses on “the kind of person you are” and is designed to emphasize impulsivity as a trait, in contrast to behavioral laboratory measures of impulsivity (Stanford et al., 2009). While BIS-11 scores can change over relatively long periods (Berlin et al., 2011; Corruble et al., 1999) and are weakly related to affective state in bipolar disorder (Swann et al., 2008), these effects are overshadowed by interindividual variations related to stable characteristics (Swann et al., 2009a). Items are rated from 1 (absent) to 4 (most extreme); scores range from 30–120 with non-psychiatric

controls generally scoring 50–60 (Stanford et al., 2009). Internal consistency was good across several different samples of subjects ($\alpha > 0.79$).

d. Statistics

For normally distributed variables, we used general linear model analysis of variance or linear multiple regression analyses. If criteria for normality were not met (Shapiro-Wilks test) we used logarithmic or square-root transformation, or appropriate nonparametric statistics if distributions were not normalized by transformation. Distributions of ASPD symptom counts and age of onset were normalized by square root transformation. Episode counts could not be normalized. Kendall tau was used for nonparametric correlational analyses because of its advantages in balancing type I and type II error (Arndt et al., 1999). To predict continuous or near-continuous dependent variables (like BIS-11 scores) by categorical and continuous independent variables, we used general linear models analysis. For prediction of dichotomous variables (like history of suicide attempt) by categorical and continuous predictor variables, we used logit analysis (Gibbons et al., 1994).

3. Results

a. Demographic and clinical characteristics

Subjects had mean age of 37.3 ± 10.2 (SD) years, age of onset of bipolar disorder 17.3 ± 9.4 years (median 17), and education 13.6 ± 2.2 years. ASPD symptoms were not normally distributed (Shapiro-Wilks $W = 0.9$, $p = 0.002$), but distributions were normalized by square-root transformation. ASPD and/or borderline personality disorder symptoms did not correlate with age, years of education, or affective symptoms (Kendall tau, $p > 0.2$), and did not differ across gender (Mann-Whitney, $z < 1$).

ASPD symptoms did not differ between subjects meeting criteria for ASPD only compared to ASPD plus borderline personality disorder (Mann-Whitney, $z = 1.3$). The same was true for borderline personality disorder symptoms in subjects meeting criteria for borderline personality disorder with or without ASPD (Mann-Whitney, $z = 1.25$).

Subjects included 16 interepisode (did not meet criteria for depressive, manic, or hypomanic episode), 9 manic/hypomanic, 17 depressed, and 12 with combined depression and mania/hypomania. Cluster B symptoms did not differ across affective states (Kruskal-Wallis; for ASPD symptoms $H(3,23) = 4.9$, $p = 0.17$, for borderline symptoms $H(3,23) = 0.5$, $p = 0.9$). Cluster B symptoms did not correlate significantly with SADS-C depression, mania, anxiety, or psychosis scores (Kendall tau < 0.12 ; $p > 0.25$). ASPD or borderline personality disorder symptom counts also did not differ between subjects taking or not taking lithium, anticonvulsants, antipsychotics, antidepressants, or combinations of these (Mann-Whitney tests, $z < 1$, $p > 0.5$), and were not related to total number of medicine groups prescribed ($F < 2$, $p > 0.25$).

b. Impulsivity and cluster B symptoms

Borderline personality disorder symptoms correlated with BIS-11 total scores ($r = 0.529$, $P < 0.001$) and with each subscale score ($P < 0.01$). ASPD symptoms (square-root transformed) correlated modestly with BIS-11 total score ($r = 0.28$, $P = 0.046$) but not with any of the subscales.

Relative roles of ASPD and borderline symptoms were evaluated using GLM analyses with BIS-11 scores as dependent variables and ASPD (square-root transformed) and borderline symptom counts, history of substance-use disorder, and gender as independent variables. As shown in Table 1, Total, motor, and attentional BIS-11 scores were predicted significantly

by borderline symptom scores with no significant contribution from ASPD scores, substance-use disorder history, or gender. These results suggest that, rather than measuring the same basic construct in subjects with bipolar disorder, borderline personality disorder symptoms are related to impulsivity, and ASPD symptoms are not.

The fact that gender had no effect implies that ASPD symptoms in men are not analogous to borderline personality traits in women. This is confirmed by multiple linear regression analyses carried out separately for men and women. In men, BIS-11 total scores were predicted by borderline symptoms ($\beta = 0.64$) but not by ASPD symptoms ($\beta = -0.25$). The relationship was similar, but weaker, for women ($\beta = 0.4$ and 0.19 , respectively).

c. Cluster B symptoms and course of illness

As shown in Table 2, both ASPD and borderline disorder symptoms had positive univariate correlations with the numbers of manic, depressive, or total episodes. ASPD, but not borderline, symptoms correlated negatively with age at onset. Neither ASPD nor borderline symptoms correlated with the number of years ill.

When ASPD and borderline symptoms were considered simultaneously, only ASPD symptoms were related to course of illness. Table 3 summarizes relative contributions of ASPD and borderline personality disorder symptoms to course of illness, based on logit analysis with presence/absence of the course of illness characteristic as dependent variable and ASPD or borderline symptoms, substance-use disorder, and age as independent variables. This analysis evaluated the extent to which ASPD and borderline symptoms independently contributed to history of frequent recurrence or early onset. ASPD symptoms predicted history of many manic and depressive episodes (but not either type alone) and early onset; there were no significant relationships between recurrent course and borderline personality disorder symptoms. Neither gender, age, nor history of a substance-use disorder was significantly related to any of the illness course variables.

Table 4 shows a similar analysis of relationships between ASPD or borderline symptoms and complications of illness, including substance-use disorders and suicide attempts. ASPD symptoms predicted history of alcohol, other substance-abuse disorder, and smoking, consistent with earlier reports (Grant et al., 2004; Rasmussen et al., 1998), while borderline symptoms were associated with non-alcohol substance-use disorder but not alcohol-use disorder or smoking. There were no specific relationships to gender.

Borderline personality disorder, but not ASPD, symptoms were associated with history of suicide attempt. This could have been a consequence of increased impulsivity or substance-use disorder associated with borderline personality disorder (Dougherty et al., 2004; Dumais et al., 2005; Mann et al., 1999; Swann et al., 2005). However, when BIS-11 total score and substance-use disorder were added to the model, neither contributed significantly to history of suicide attempt (Wald statistic = 1.35 and 0.7, respectively) while borderline personality symptoms still contributed significantly (Wald statistic = 3.8, $p < 0.05$).

Table 5 summarizes GLM analyses of the effects of illness course and impulsivity on ASPD or borderline personality disorder symptoms. Borderline, but not ASPD symptoms were significantly related to BIS-11 scores. ASPD, but not borderline, symptoms were related to age of onset and severely recurrent illness with many manic and many depressive episodes. As in the logit analyses, neither ASPD nor borderline symptoms were related to the number of years that had elapsed since the first episode. In addition, there were no significant effects or interactions involving gender.

4. Discussion

Relative to our original hypotheses, the results showed that 1) among subjects with bipolar disorder, personality disorder symptoms were not related to affective state or symptom severity, and borderline symptoms were more strongly related to impulsivity than ASPD symptoms were; 2) ASPD symptoms were more strongly related than borderline symptoms to early onset, recurrent course of illness, and substance-use disorders; and 3) these relationships were independent of gender. In interpreting these results, it is important to keep in mind the question of what is being measured by symptom counts, and to avoid the temptation to consider symptom counts as representing the presence of an additional illness condition.

a. Trait impulsivity and cluster B symptoms

Measures of impulsivity have been reported to correlate significantly with the number of ASPD symptoms in adults with history of conduct disorder (Dougherty et al., 2000) or borderline personality disorder symptoms in parents of adolescents with disruptive behavior disorders or controls (Swann et al., 2002). This suggests that lifetime symptoms endorsed can be considered an indicator of severity of the personality disorder. The data support earlier suggestions that characteristics of cluster B personality disorders may most accurately be considered as dimensional, rather than categorical (Fossati et al., 2000). The differential relationships between clinical characteristics and ASPD or borderline personality disorder symptoms suggest that this is not merely a result of more impulsive subjects endorsing more symptoms in general. The data suggest that borderline personality disorder symptoms are more closely related to trait impulsivity than are ASPD symptoms in bipolar disorder.

Substance-use disorders are generally associated with impulsivity (Moeller et al., 2001), including in bipolar disorder (Swann et al., 2004). The lack of a significant effect in Table 1 suggests that the mechanism by which substance use is related to impulsivity is mediated by a mechanism similar to that producing the borderline personality disorder symptoms.

b. Cluster B symptoms and course of bipolar disorder

Cluster B symptoms were related to the course of bipolar disorder, being significantly associated with history of substance use disorders and a recurrent course. ASPD and borderline symptoms correlated differently with course of illness. ASPD symptoms were associated with early onset of illness and with increased frequency of episodes, without specific relationships to depressive or manic episodes (Quanbeck et al., 2004). ASPD symptoms were also more strongly related than borderline symptoms to alcohol- and substance-use disorders. Borderline symptoms were related to course of illness in univariate analyses (Table 2), but these relationships disappeared in multivariate analyses that included ASPD symptoms (Table 3). The fact that ASPD and borderline symptom counts were differentially related to impulsivity and course of illness suggests that these symptoms represent dimensional characteristics, associated in a complementary manner with impulsivity and with a complicated course of illness (Maffei et al., 1997).

Borderline personality disorder symptoms were significantly related to suicide attempt history, while ASPD symptoms were not. This is consistent with reported relationships between increased impulsivity and risk for suicide (Dougherty et al., 2004; Dumais et al., 2005; Mann et al., 1999; Simon et al., 2001; Swann et al., 2005). However, when measures of impulsivity were added to the model, borderline personality disorder symptom count still contributed significantly, suggesting an independent role beyond impulsivity.

The lack of significant correlations between cluster B symptoms and current affective symptoms reflected the fact that affective symptoms represent current state, while SCID-II cluster B symptoms represent trait-like characteristics. ASPD symptoms, for example, may be associated with susceptibility to frequent manic or depressive episodes (Table 3), but appear less related to acute affective symptoms themselves.

These data are consistent with evidence that aspects of cluster B disorders are, or resemble, dimensional characteristics related to severity of bipolar disorder (Henry et al., 2001; Maffei et al., 1997), in a manner that can be partially differentiated from impulsivity and affective symptoms. ASPD and borderline personality disorder symptoms were differentially related to clinical characteristics, with ASPD symptoms more strongly related to course of illness, and borderline personality disorder symptoms more strongly related to impulsivity.

Possible relationships between personality disorders and severity for bipolar disorder have been reported. Presence of a cluster B personality disorder in bipolar disorder was associated with poor outcome after a manic episode (Dunayevich et al., 2000), more suicide attempts (Garno et al., 2005; Leverich et al., 2003), and a “difficult” course of illness (Kay et al., 2002) with greater service utilization (Lembke et al., 2004). Prevalence of personality disorder diagnosis is greater in multi-episode than in first-episode bipolar disorder (Dunayevich et al., 1996); it remains to be established whether this represents an a priori relationship to a more recurrent form of the illness, or a consequence of many episodes (Peluso et al., 2007). The data in this paper suggest that, rather than an additional comorbid illness, the apparent effect of combined disorders could represent dimensional characteristics of bipolar disorder that resemble “personality disorders.”

The relationship between ASPD symptoms and course of illness could result from greater occurrence of antisocial behavior during episodes, especially manic (Quanbeck et al., 2004; Swann et al., 2011). However, ASPD symptoms were related to more total episodes, but not to manic episodes (Tables 3 and 5). ASPD symptoms could also be related to substance use disorders (Table 4) due to drug-related crimes. Of the 15 ASPD symptoms in the SCID-II, however, only five are directly related to criminal acts (First et al., 1997). Further, we have shown that, in bipolar disorder, most convictions were not for drug-related crimes (Swann et al., 2011).

As with relationships between BIS-11 scores and borderline personality disorder symptoms, substance-use disorder history had no significant influence on relationships between cluster B symptoms and course of illness, including frequent episodes and early onset. This appears to contradict reports of earlier onset of bipolar disorder in subjects with substance use disorders (Bauer et al., 2005; Sonne et al., 1994). However, those studies generally did not control for either cluster B personality disorders or their symptoms; a previous study reported early onset in subjects with bipolar disorder and ASPD and a substance-use disorder (Goldstein et al., 2006); other comorbid Axis I disorders have also been shown to account for early age of onset in combined bipolar and substance-use disorders (Bauer et al., 2005; McElroy et al., 2001).

c. Cluster B symptoms and gender

These results suggest that symptoms associated with ASPD and borderline personality disorders are related differentially with course of bipolar disorder and trait impulsivity, independent of gender. This contradicts the idea that ASPD and borderline personality disorder represent the analogous, gender-related expression of similar underlying characteristics in women versus men (Looper et al., 2000; Paris, 1997), at least in bipolar disorder. Gender had no effect on substance-use disorders or attempted suicide in these subjects. This confirmed other reports that bipolar disorder increases risk for suicidal

behavior (Angst et al., 2002; Azorin et al., 2009; Osby et al., 2001), substance and alcohol-use disorders (Friedman et al., 2005; Hendrick et al., 2000; McDermott et al., 2007), and criminal or violent behavior (Friedman et al., 2005; Krakowski et al., 2004; McDermott et al., 2007) disproportionately in women, reducing or eliminating the general preponderance of these behaviors in men.

d. Limitations

Potential limitations include 1) course of illness characteristics were determined retrospectively; 2) subjects were taking a variety of medicines; 3) ASPD or borderline characteristics may have different mechanisms in individuals with bipolar disorder compared to those without bipolar disorder; and 4) characteristics of cluster A and C personality disorders were not investigated.

e. Conclusions

Characteristics associated with cluster B personality disorder symptoms were differentially related to severity of bipolar disorder. Borderline personality disorder symptom counts were related to trait-like impulsivity, measured by the BIS-11, but not to course of illness. ASPD symptom counts were related to course of illness (many episodes or early onset) but not to impulsivity. Gender did not account for these differences. ASPD and borderline personality disorder symptom counts may be useful indices of problems associated with bipolar disorder, but cannot be taken as evidence for an additional disorder. The dimensional relationship between personality disorder symptoms and specific aspects of bipolar disorder reveal the potential limitations of a categorical system of diagnosis (Blacker et al., 1992).

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Table 1

Relationships Between Cluster B Symptoms and BIS-11 Scores in Bipolar Disorder

	ASPD symptoms		Borderline symptoms		SUD	Gender
	F (df=1,46)	Beta	F (df=1,46)	Beta		
BIS-11						
Total score	0.12	0.078	9.30 (0.004)	0.481	0.07	0.12
Nonplanning	0.02	0.108	2.83 (0.09)	0.328	0.52	0.98
Motor	0.08	0.046	7.47 (0.009)	0.418	1.28	0.01
Attentional	0.22	0.038	9.65 (0.003)	0.475	0.27	0.18

The Table shows F ratios or beta for relationships between BIS-11 total or subscale scores (see Methods) and square root-transformed ASPD or borderline symptom counts, or gender. SUD=substance-use disorder. P values are in parentheses; significant relationships are shown in bold face.

Table 2

Cluster B Symptoms and Course of Bipolar Disorder

	ASPD	Borderline
Manic episodes	0.225 (0.017)	0.220 (0.02)
Depressive episodes	0.249 (0.008)	0.279 (0.002)
Total episodes	0.263 (0.005)	0.259 (0.006)
Age of onset	-0.423 (0.000005)	-0.178
Years ill	0.110	-0.071

The Table shows Kendall tau; significant relationships are shown in bold face with P values in parentheses.

Table 3

Relative Contributions of ASPD and Borderline Personality Disorder Symptoms to Course of Illness in Bipolar Disorder

	Many manic	Many depressed	Many manic and depressed	Onset < 16 yr
ASPD symptoms	0.61	2.24	4.57[*]	8.80^{**}
Borderline symptoms	0.38	2.19	2.75	0.04
Substance-use disorder	1.51	0.03	0.11	<0.01
Age	2.56	2.13	2.87	0.05
Gender	0.13	0.83	0.33	<0.01

The Table shows Wald statistics for a series of logit analyses with many depressive, manic, or total episodes, or early onset (<16 years) as dichotomous dependent variables. Histories of many episodes are defined as described in Methods. Antisocial personality disorder (ASPD) symptoms (square root transformed), borderline personality disorder symptoms, substance-use disorder history, age, and gender were independent (predictor) variables.

Significant relationships are shown in bold face:

* $P < 0.05$;

** $P < 0.005$.

Relative Contributions of ASPD and Borderline Personality Disorder Symptoms to Complications of Bipolar Disorder

Table 4

	Alcohol use disorder	Drug use disorder	Alcohol or drug	Alcohol and drug	Smoking	Suicide attempt
ASPD symptoms	9.1***	8.2***	7.7**	10.2***	9.7***	0.4
Borderline symptoms	1.1	4.5*	3.6	2.4	0	6.1*
Age	5.4*	0.1	0.1	5.4*	1.2	0.2
Gender	0.8	0.1	0.5	0	1.9	1.1

The Table shows Wald statistics for a series of logit analyses with alcohol use disorder, other substance use disorder, smoking, or suicide attempt history as dichotomous dependent variables. Antisocial personality disorder (ASPD; square root transformed) symptoms, borderline personality disorder symptoms, age, and gender were independent (predictor) variables.

Significant relationships are shown in bold face:

* P < 0.05;

** P < 0.01;

*** P < 0.005.

Table 5

Course of illness and borderline or ASPD symptoms in bipolar disorder

Many mania	Many dep.	N	Borderline	ASPD
No	No	14	3.00 ± 2.00	4.71 ± 3.97
No	Yes	6	3.40 ± 2.30	4.67 ± 4.32
Yes	No	11	3.18 ± 2.09	4.10 ± 3.78
Yes	Yes	20	5.00 ± 2.56	8.20 ± 4.46
GLM F, df = 1,43	BIS-11 total score		7.6 (0.009)	1.3
	Age of onset		0.4	11.8 (0.0006)
	Many manic		0	0.1
	Many depressed		2.9 (0.09)	0.6
	Many manic X depressed		0.3	4.6 (0.038)

The Table shows results of GLM where borderline or ASPD symptom counts were dependent variables. Age of onset and ASPD symptom counts were square-root transformed to obtain normal distributions (non-transformed data are shown). "Many manic" or "many depressed" was as defined in Methods. There were no significant main effects or interactions with gender. Post hoc analysis showed that ASPD symptoms in subjects with many manic and many depressed episodes were higher than with many manic, many depressed, or neither, $P < 0.05$).