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TEMPERAMENT AND CHARACTER TRAITS IN PATIENTS WITH BIPOLAR DISORDER AND ASSOCIATIONS WITH COMORBID ALCOHOLISM OR ANXIETY DISORDERS

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Abstract

Temperament and character traits may determine differences in clinical presentations and outcome of bipolar disorder. We compared personality traits in bipolar patients and healthy individuals using the Temperament and Character Inventory (TCI) and sought to verify whether comorbidity with alcoholism or anxiety disorders is associated with specific personality traits. Seventy three DSM-IV bipolar patients were compared to 63 healthy individuals using the TCI. In a second step, the bipolar sample was subgrouped according to the presence of psychiatric comorbidity (alcoholism, $n = 10$; anxiety disorders; $n = 23$; alcoholism plus anxiety disorders, $n = 21$; no comorbidity, $n = 19$). Bipolar patients scored statistically higher than the healthy individuals on novelty seeking, harm avoidance and self-transcendence and lower on self-directedness and cooperativeness. Bipolar patients with only comorbid alcoholism scored statistically lower than bipolar patients without any comorbidity on persistence. Bipolar patients with only comorbid anxiety disorders scored statistically higher on harm avoidance and lower on self-directedness than bipolar patients without any comorbidity. Limitations of this study include the cross-sectional design and the small sample size, specifically

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in the analysis of the subgroups. However, our results suggest that bipolar patients exhibit a different personality structure than healthy individuals and that presence of psychiatric comorbidity in bipolar disorder is associated with specific personality traits. These findings suggest that personality, at least to some extent, mediates the comorbidity phenomena in bipolar disorder.

Keywords

bipolar disorder; personality; comorbidity; alcoholism; anxiety disorders; psychopathology

1. Introduction

“We are, therefore, led to the conclusion, that there are certain temperaments which may be regarded as rudiments of manic-depressive insanity. They may throughout the whole of life exist as peculiar forms of psychic personality without further development; but they may also become the point of departure for a morbid process which develops under peculiar conditions and runs its course in isolated attacks.” Emil Kraepelin, in *Manic Depressive Insanity*

Bipolar disorder is a severe and debilitating psychiatric disorder with an unpredictable course and a high impact on social and occupational life. Historically, personality has been considered a vulnerability factor or a behavioral marker for bipolar disorder (Kraepelin, 1976; Angst, 2000). It also has been proposed that personality may shape the clinical presentation or outcome of affective disorders or that personality may be modified by repeated mood episodes (Akiskal et al., 1983). Bipolar disorder and specific personality traits may even share a common familial or genetic predisposition (Staner et al., 1998; Blairy et al., 2000; Rogers et al., 2004).

Studies that evaluated the personality of bipolar patients using the Temperament and Character Inventory (TCI) reinforced these concepts. The TCI is based on a psychobiological model of personality, which assumes that personality derives from the dynamic interaction among four temperament and three character traits (Cloninger et al., 1993). Temperament traits (novelty seeking, harm avoidance, reward dependence and persistence) represent basic emotional responses, which are manifested early in life, are stable throughout life and are moderately heritable. Character traits (self-directedness, cooperativeness and self-transcendence) represent concepts about self and personal relations, which are regulated by supervisory cognitive processes that develop throughout life (Cloninger et al., 1994; Cloninger et al., 2005). When compared to healthy individuals, bipolar patients achieve higher scores on novelty seeking (Young et al., 1995; Osher et al., 1999; Evans et al., 2005), harm avoidance (Young et al., 1995; Osher et al., 1996; Engstrom et al., 2004a; Evans et al., 2005) and reward dependence (Osher et al., 1996), and lower scores on persistence (Osher et al., 1996; Osher et al., 1999) and self-directedness (Engstrom et al., 2004a; Evans et al., 2005). In bipolar disorder, higher scores on harm avoidance were also associated with early onset of disease and fewer suicide attempts (Engstrom et al., 2003; Engstrom et al., 2004b).

It is also noteworthy that bipolar disorder is associated with high rates of comorbidity with other Axis I disorders, including alcoholism and anxiety disorders (Regier et al., 1990; Kessler et al., 1997; McElroy et al., 2001; Simon et al., 2004). In bipolar disorder, lifetime prevalence of alcoholism can reach 33% to 46% (Regier et al., 1990; McElroy et al., 2001), while rates of anxiety disorders reach 42% to 51% (McElroy et al., 2001; Simon et al., 2004). Personality is an important factor in each of these isolated disorders. Alcoholic patients have significantly higher novelty seeking scores and lower self-directedness scores compared to healthy individuals (Basiaux et al., 2001; Le Bon et al., 2004) and higher novelty seeking is associated with poly-substance abuse in drug addicts (Conway et al., 2003). Patients with anxiety disorders

have higher scores on harm avoidance and lower scores on novelty seeking and self-directedness compared with healthy individuals (Lyo et al., 2001; Ball et al., 2002; Pélissolo et al., 2002).

Although specific personality profiles occur in patients with bipolar disorder as well as those with alcohol and anxiety disorders, previous research has not specifically addressed the question of whether personality is associated with the occurrence of comorbidity in bipolar disorder. In this study, our objectives were: 1) to compare the personality structures of bipolar patients and healthy individuals using the TCI; 2) to compare the personality structure of bipolar patients with and without comorbid alcoholism or anxiety disorders. Based on previous studies, our first hypothesis was that bipolar patients would differ from healthy individuals on some personality traits, particularly higher levels of novelty seeking and harm avoidance. Our second hypothesis was that bipolar patients without any comorbid condition would present a different personality structure when compared to bipolar patients with comorbid alcoholism or anxiety disorders. If personality structure is related to comorbidity, then knowing the manner in which personality traits are manifested in bipolar disorder patients with and without comorbidity might help to disentangle the factors implicated in the etiology and clinical course of this disorder and assist in optimizing research and treatment planning.

2. Material and methods

2.1. Sample

This analysis included a sample of 136 subjects. All of the bipolar patients and healthy controls were residents of the San Antonio metropolitan area or surrounding cities. The subjects were recruited through local media advertisements and flyers posted in the medical center. Inclusion criteria for the bipolar patients were: diagnosis of bipolar disorder, type I or II and age of 18 to 99 years. Any mood state was allowed. Exclusion criteria for bipolar subjects were presence of any other Axis I diagnosis except lifetime anxiety disorders and/or alcoholism, presence of significant medical problems and presence of neurological disorders. The exclusion criteria for healthy individuals were presence of any past or current Axis I or II psychiatric disorder, presence of any current neurological or medical problems and presence of any Axis I diagnosis in first-degree relatives. All investigation was conducted in accordance with the Declaration of Helsinki, and the study was approved by the local institutional review board. After complete description of the study to the subjects, written informed consent was obtained.

2.2. Measures

The diagnostic assessments were conducted using the Structured Clinical Interview for Axis I DSM-IV Disorders (SCID), versions for patients and non-patients (First et al., 2002). The 21-item Hamilton Depression Rating Scale (HDRS) and the Young Mania Rating Scale (YMRS) were administered to all bipolar patients and healthy individuals to assess severity of mood symptoms (Hamilton, 1976; Young et al., 1978).

Personality traits were assessed using the Temperament and Character Inventory (TCI) (Cloninger et al., 1994). The TCI is a self-report questionnaire composed of 240 true-false items designed to measure individual differences on 7 dimensions of temperament and character. The psychometric properties of the TCI have been extensively evaluated in normative and clinical samples (Cloninger et al., 1994).

2.3. Statistical analyses

Exact X^2 tests for cross tabulated qualitative data and Mann-Whitney U test or analysis of variance (ANOVA) for ordinal and interval scale data were used to evaluate the clinical and demographic variables between bipolar patients and healthy individuals or among subgroups

of bipolar patients with and without comorbidity. Analysis of covariance (ANCOVA) with age and gender as covariates was used to compare the mean TCI dimension scores between bipolar patients and healthy individuals, and to compare effects of medication status on mean TCI dimension scores between medicated and unmedicated patients. Spearman correlations or partial correlations were used to examine the bivariate associations between the TCI personality traits and specific clinical characteristics of the subjects. To investigate the effect of comorbidity on the TCI dimension scores in bipolar patients, the patient sample was divided in 4 subgroups according to the presence of comorbid alcoholism and/or anxiety disorders [bipolar without any comorbidity, bipolar with only comorbid alcohol, bipolar with only comorbid anxiety disorder, bipolar with dual comorbidity (alcoholism plus anxiety disorder)]. The mean TCI dimension scores among these subgroups were compared using ANCOVA with age, gender and mood state (as measured by HDRS and YMRS) as covariates. All reported means and standard deviations are the unadjusted values. The level of significance was set at 5%; Sidak adjustment for multiple comparisons among subgroups was used. SPSS (SPSS, Inc., Chicago, IL) version 12.0 was used to do all analyses.

3. Results

3.1. Demographic and clinical characteristics

Seventy three DSM-IV bipolar patients (mean age $\pm$ S.D.: 37.8 ± 11.5 y; males: 35.6%) were compared to 63 healthy individuals (34.5 ± 10.5 y; males: 31.7%). There was no statistical difference between bipolar patients and healthy individuals regarding age ($p = 0.06$, Mann Whitney U test) and gender ($p = 0.59$, Fisher Exact test). The bipolar sample was composed predominantly by bipolar disorder type I (87.7%), in a major depressive episode (61.6%), with a HDRS score of 16.5 ± 9.0 and YMRS mean score of 8.8 ± 7.1 . Fifty six (76.7%) of the bipolar sample was in use of medication (mood stabilizers, antidepressants or anxiolytics). There were no main effects of medication status on any of the TCI personality traits (ANCOVA, with age and gender as covariates; results not shown). In the bipolar group, 31 (42.5%) subjects had a comorbid diagnosis of alcoholism. Forty four of the 73 bipolar subjects (60.3%) presented a diagnosis of at least one anxiety disorder. Dual comorbidity (both alcoholism and anxiety disorder) was present in 21 (28.8%) of these patients. Nineteen (26%) subjects had no comorbidity with either alcoholism or anxiety disorder. Details of the clinical characteristics of the bipolar group are displayed in Table 1.

3.2. Effects of diagnosis of bipolar disorder on personality traits

ANCOVA showed that bipolar patients scored significantly higher on novelty seeking ($F_{(1,132)} = 29.6$; $p < 0.001$), harm avoidance ($F_{(1,132)} = 86.4$; $p < 0.001$) and self-transcendence ($F_{(1,132)} = 22.3$; $p < 0.001$) than healthy individuals. The bipolar patients scored significantly lower on self-directedness ($F_{(1,132)} = 181.5$; $p < 0.001$) and cooperativeness ($F_{(1,132)} = 28.8$; $p < 0.001$). Bipolar patients did not differ significantly from healthy individuals on reward dependence ($F_{(1,132)} = 0.8$; $p = 0.39$) and persistence ($F_{(1,132)} = 2.5$; $p = 0.12$). The means and S.D. for each dimension score for each of these groups are displayed in Table 2.

In the bipolar patients, self-directedness was negatively correlated with depression severity as measured by the HDRS ($r = -0.23$, $p = 0.049$) and positively correlated with age ($r = 0.24$, $p = 0.04$). There were no other significant bivariate correlations between the TCI dimensions and age, depression or mania severity. Age at onset or number of hospitalizations had no correlations with any of the TCI dimension scores. Length of illness had a weak to moderate correlation with self-transcendence, after controlling for age ($r = 0.27$, $p = 0.033$). In the healthy control group, age was positively correlated with self-transcendence ($r = 0.44$, $p < 0.001$).

3.3. Effects of comorbid alcoholism and/or comorbid anxiety disorders on personality traits

We studied the effects of comorbidity by dividing the bipolar sample according to the presence of comorbid alcoholism and/or anxiety disorder. Nineteen (26%) patients presented no comorbid condition, 10 (13.7%) presented only comorbid alcoholism, 23 (31.5%) presented only comorbid anxiety disorder, and 21 (28.8%) presented both comorbid alcoholism and anxiety disorder. These 4 subgroups did not statistically differ on age (ANOVA, $F_{(3,69)} = 0.48$, $p = 0.7$) and YMRS score ($F_{(3,69)} = 2.3$, $p = 0.09$) as well as age at disease onset and length of illness, but were statistically different in the distribution of gender (Chi square test, $p = 0.007$) and HDRS score (ANOVA, $F_{(3,69)} = 6.7$, $p < 0.001$) (Table 3).

ANCOVA, with age, gender and mood state (measured by HDRS and YMRS) as covariates, revealed that these 4 subgroups of bipolar patients statistically differ from each other on harm avoidance ($F_{(3,65)} = 3.6$, $p = 0.017$), persistence ($F_{(3,65)} = 2.8$, $p = 0.047$) and self-directedness ($F_{(3,65)} = 4.8$, $p = 0.004$). These groups did not statistically differ on novelty seeking ($F_{(3,65)} = 2.6$, $p = 0.06$), reward dependence ($F_{(3,65)} = 2.5$, $p = 0.06$), cooperativeness ($F_{(3,65)} = 2.4$, $p = 0.07$) and self-transcendence ($F_{(3,65)} = 1.7$, $p = 0.17$).

Pairwise comparisons with Sidak adjustment for multiple comparisons showed that the bipolar patients with only comorbid anxiety disorder ($n = 23$) presented statistically higher scores on harm avoidance (mean $\pm$ S.D.: 23.1 ± 6.0 versus 14.6 ± 7.6 , $p = 0.013$) and lower scores on self-directedness (21.9 ± 1.6 versus 29.6 ± 1.8 , $p = 0.013$) than the bipolar patients without any comorbid disorders ($n = 19$). Bipolar patients with only comorbid alcoholism ($n = 10$) presented statistically lower scores on persistence than bipolar patients without any comorbid disorders (3.2 ± 0.8 versus 5.8 ± 0.6 , $p = 0.044$). Lastly, bipolar patients with dual comorbidity ($n = 21$) presented statistically lower scores on self-directedness than bipolar patients without any comorbid conditions (20.6 ± 1.6 versus 29.6 ± 1.8 , $p = 0.004$). There was no difference between these 4 groups on any of the other personality dimensions (Table 3).

4. Discussion

We found that bipolar patients present higher levels of novelty seeking, harm avoidance and self-transcendence and lower levels of self-directedness and cooperativeness than healthy individuals. In bipolar patients, self-directedness decreased as the depression severity increased. Self-transcendence increased as the length of illness increased, even after controlling for age. Moreover, we also found that bipolar patients with comorbid conditions such as alcoholism or anxiety disorders differed from bipolar patients without any comorbid condition on certain personality traits. Specifically, bipolar patients with comorbid alcoholism had lower levels of persistence than those bipolar patients who never had any comorbidity. Bipolar patients with comorbid anxiety disorder presented higher harm avoidance and lower self-directedness levels than those bipolar patients who never had any comorbidity. Lastly, bipolar patients with dual comorbidity presented lower scores of self-directedness than bipolar patients without comorbidities.

4.1. Personality differences between bipolar patients and healthy individuals

Regarding the temperament traits, we found higher levels of novelty seeking and harm avoidance in bipolar patients in comparison to healthy individuals. While higher harm avoidance has been consistently linked to mood disorders in general (Cloninger et al., 1994; Brown et al., 1992; Joffe et al., 1993; Hirano et al., 2002), and with bipolar disorder in particular (Blairy et al., 2000; Osher et al., 1996; Osher et al., 1999; Engstrom et al., 2004a; Evans et al., 2005), higher novelty seeking in bipolar patients compared to both unipolar patients and healthy individuals has been reported by one study (Young et al., 1995). In the same study, bipolar patients presented higher novelty seeking than unipolar patients, and both groups had higher

harm avoidance than the healthy control group, indicating that the combination of higher novelty seeking and harm avoidance might be a characteristic of bipolarity. Individuals high in novelty seeking are described as exploratory, curious, impulsive, extravagant, enthusiastic and disorderly (Cloninger et al., 1994), features that resemble the characteristics of manic phases and also Kraepelin's original conception of temperament as a rudimentary form of the full blown illness (Kraepelin, 1976). We investigated effects of mood state in the bipolar group by performing bivariate correlations between scores of manic and depressive symptoms and the TCI dimension scores. Novelty seeking was not associated with any effect of mood state, which reinforces that higher levels of novelty seeking may characterize some bipolar patients.

Turning attention to the character traits, bipolar patients presented lower self-directedness and cooperativeness and higher self-transcendence than healthy individuals. Two other studies support the conclusion that bipolar patients differ from healthy individuals in self-directedness (Engstrom et al., 2004a; Evans et al., 2005). By definition, character traits are progressive and depend on the unique and multiple experiences an individual has throughout life. Therefore, we speculate whether manifestations of Axis I conditions have adverse consequences on the development and expression of character traits, explaining the lower levels of self-directedness in bipolar patients. Bipolar patients also presented higher levels of self-transcendence in comparison with healthy individuals, and moreover, self-transcendence had a positive correlation with length of illness. One study also showed higher self-transcendence scores in bipolar patients compared with healthy individuals (Evans et al., 2005). This character trait may confer adaptive advantages in face of suffering and death (Cloninger et al., 1994) and therefore, we speculate whether higher self-transcendence in bipolar patients represent an adaptive process of dealing with their condition. In Table 4, we present a representative summary of the major TCI findings in bipolar disorder from previous studies and we highlight those findings that are replicated by this present study.

4.2. Personality differences in bipolar disorder with comorbid alcohol and/or anxiety disorders

Alcoholic bipolar patients scored lower than non-alcoholic bipolar patients on persistence. Lower levels of persistence also are associated with a diagnosis of metamphetamine abuse (Hosak et al., 2004), but studies using the TCI found no association between alcohol abuse and persistence, in spite of findings of higher novelty seeking and lower self-directedness in alcoholic patients compared to healthy individuals (Basiaux et al., 2001; Le Bon et al., 2004). Persistence is related to the ability to persevere despite frustration and fatigue, and it is possible that bipolar patients with low persistence may have more difficulty in stopping alcohol use despite its adverse consequences. The same may be so for methamphetamine abuse. It is noteworthy that alcoholic bipolar patients presented numerically higher scores on novelty seeking and lower scores on self-directedness than bipolar patients without any comorbidity (Table 3), and there is a possibility that, due to the small sample size of this specific subgroup ($n = 10$), these numbers failed to reach statistical significance. In spite of the cross-sectional design of our study, it is very tempting to speculate whether lower persistence combined to higher novelty seeking (more risk taking behaviors) and lower self-directedness (less ability to control and regulate one's own behavior) might jointly predispose bipolar patients to develop alcohol use disorders, contributing to the high prevalence rates of alcoholism in this population.

Bipolar patients with comorbid anxiety disorders presented higher harm avoidance and lower self-directedness than bipolar patients without any anxiety disorder. This combination (higher harm avoidance and lower self-directedness) also characterizes the differences between anxiety disorder patients and healthy individuals (Lyoo et al., 2001; Ball et al., 2002; Pélissolo et al., 2002), therefore suggesting that the presence of anxiety explains more this combination than a bipolar component. Alternatively, if a principal component of bipolar disorder entails anxiety,

then the similar profile could equally reflect an intrinsic biological characteristic that is common to anxiety and bipolar disorders. In this regard, some authors defend that anxiety/depression may be a primary dimension rather than a co-occurrence of conditions in bipolar disorder (Swann et al., 2001). Another consideration is the potential confounding influence of depression severity. Bipolar patients with only comorbid anxiety disorder and bipolar patients with both comorbid alcoholism and anxiety presented the highest HDRS scores (see Table 3). Therefore, the more severe depression exhibited by the patients with these comorbid disorders could influence their self directedness scores. To examine this possibility, we performed ANCOVA while statistically holding depression severity constant by including the HDRS score as a covariate. The bipolar patients with alcohol and anxiety comorbidity still presented significantly lower scores on self-directedness.

Because the subdivision of the bipolar sample resulted in small subgroups of bipolar patients, with differences in certain demographic characteristics, such as sex distribution and intensity of depressive symptoms, we should state that any interpretation of these findings should be considered speculative at this time. However, it is important to note that our findings of differences in personality traits according to the presence of comorbid alcoholism or comorbid anxiety disorder in bipolar patients are consistent with previous studies showing that personality, at least to some extent, mediates the comorbidity phenomena in psychiatric disorders (Battaglia et al., 1996; Khan et al., 2005). In Table 4, we show some major TCI findings in alcohol/drug use disorders and anxiety disorders to better illustrate the complex inter-relationship between bipolar disorder, psychiatric comorbidity and personality traits.

One limitation of this study is the high frequency of symptomatic bipolar patients, and therefore, a possible contamination of self-reports by the current mood state. The issue of whether changes in the levels of personality traits observed in the context of a mood episode reflect state artifacts rather than genuine changes in personality or in the enduring pattern that characterizes a 'trait' has been a long-standing controversy (Costa Jr. et al., 2005). Some authors contend that the clinical mood state influences patients' self-perceptions and therefore, should be considered when symptomatic patients are evaluated (Hirschfeld et al., 1983), whereas others claim that patients' responses during different illness phases are internally consistent, have a high agreement with ratings from informants and may actually reflect real personality changes intrinsic to the episode (Bagby et al., 1998; Costa Jr. 2005). Regarding the TCI, some studies demonstrate a possible mood state effect for harm avoidance, self-directedness and cooperativeness in unipolar patients (Brown et al., 1992; Chien and Dunner, 1996; Kleifield et al., 1994; Hirano et al., 2002). On the other hand, Sato et al (2001) demonstrated that the TCI has a high internal consistency and a factor structure that is robust against mild to moderate states of depression (as it is in this study). Although we studied mostly symptomatic BD patients, our results replicated most of the previous findings of temperament and character traits in euthymic BD subjects (Young et al., 1995; Osher et al., 1996; Osher et al., 1999; Blairy et al., 2000; Engstrom et al., 2004a; Evans et al., 2005). Therefore, although mood state effects are possible, it is unlikely that they explain our findings of personality differences between BD patients and healthy individuals. Another approach to control the effect of current mood state and further investigate any possible interactions between mood episodes and personality in BD would be by comparing the bipolar patients across different types of episodes (euthymic, major depressive episode, manic/mixed episode). Our euthymic BD subgroup had a small size (n=6) however, which made such comparison unfeasible. This is nevertheless an important and under-studied area, and future research is necessary to address it.

Other limitations of this study include the relatively small sample size, especially in the comorbid subgroups, the cross-sectional design, the lack of comparison with groups of alcoholic patients and anxiety disorder patients (without bipolar disorder). However, this study

has also important strengths. We replicated previous findings of higher levels of novelty seeking and harm avoidance in bipolar patients in comparison to healthy individuals, and this combination might indicate a “bipolarity” feature. Because temperament traits are supposedly heritable, stable and manifest early in life, these findings might point to core biological features of personality that precede disease onset and that suffer less influence from the disease process, and therefore, help in the search for genetic and neurobiological roots of bipolar disorder. We also demonstrated that the presence of psychiatric comorbidities in bipolar disorder might be associated with specific personality traits.

In conclusion, bipolar patients exhibit a different personality structure from healthy individuals. Novelty seeking, harm avoidance, self-directedness and cooperativeness are the personality traits most closely related to bipolar disorder. The combination of high novelty seeking and high harm avoidance might be a characteristic of bipolarity. Personality traits may contribute, at least in part, to the development of comorbidity in bipolar disorder, and alternatively, the presence of comorbidity in bipolar disorder may affect some personality traits. Comorbid alcoholism is associated with lower levels of persistence in bipolar disorder. Presence of comorbid anxiety disorder in bipolar disorder is associated with higher harm avoidance and lower self-directedness scores. Recognition of these associations may bring new insights to the underlying phenomena involved in the etiology of comorbidity in bipolar disorder and lead to a more appropriate management of these patients.

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Table 1

Clinical characteristics of the bipolar group

Characteristics	Bipolar Patients (n = 73)
Age of onset of bipolar disorder (mean $\pm$ S.D.)	20.9 $\pm$ 9.3
Length of illness (mean $\pm$ S.D.)	17.3 $\pm$ 12.3
<i>Lifetime alcoholism (n, %)</i>	31 (42.5)
Abuse	6 (8.2)
Dependence	25 (34.2)
<i>Lifetime anxiety disorder (any) (n, %)</i>	44 (60.3)
Panic disorder	20 (27.4)
Agoraphobia	2 (2.7)
Social phobia	13 (17.8)
Specific phobia	8 (11)
Obsessive compulsive disorder	8 (11)
Post traumatic stress disorder	16 (21.9)
Generalized anxiety disorder	15 (20.5)
Anxiety disorder NOS	3 (4.1)
<i>Mood state (according to SCID) (n, %)</i>	
Euthymic	6 (8.2)
Major depressive episode	45 (61.6)
Mixed episode	10 (13.7)
Manic episode	12 (16.4)

Abbreviations: HAMD (Hamilton Depression Rating Scale); YMRS (Young Mania Rating Scale), NOS (Not Otherwise Specified); SCID (Structured Clinical Interview for Diagnosis).

Table 2

TCI dimension scores in bipolar patients and healthy individuals*

Dimensions	Bipolar patients (n = 73)	Healthy individuals (n = 63)	F _(df)	P value
	Mean ± S.D.	Mean ± S.D.		
<i>Temperament traits</i>				
Novelty seeking	23.0 ± 6.6	17.5 ± 5.3	29.6 _(1,132)	< 0.001
Harm avoidance	19.7 ± 7.4	9.5 ± 5.6	86.3 _(1,132)	< 0.001
Reward dependence	15.8 ± 4.0	16.6 ± 4.2	0.8 _(1,132)	0.4
Persistence	5.0 ± 2.3	5.6 ± 2.1	2.5 _(1,132)	0.12
<i>Character traits</i>				
Self-directedness	23.8 ± 8.1	39.0 ± 4.2	181.5 _(1,132)	< 0.001
Cooperativeness	31.6 ± 7.0	37.0 ± 4.2	28.8 _(1,132)	< 0.001
Self-transcendence	19.2 ± 6.8	13.4 ± 6.2	22.3 _(1,132)	< 0.001

* Analysis of covariance (ANCOVA), with age and gender as covariates

Table 3 Clinical and TCI personality traits differences among subgroups of bipolar patients divided according to comorbidity with alcoholism and/or anxiety disorders

Characteristics	No comorbidities (n = 19)	Comorbid alcoholism (n = 10)	Comorbid anxiety disorder (n = 23)	Dual comorbidity alcoholism plus anxiety disorders (n = 21)	F _(df)	P value
Gender (males, %) [*]	7 (36.8%)	8 (80%)	4 (17.4%)	7 (33.3%)	3	0.007
Age (mean ± S.D.) ^{**}	39.8 ± 11.4	38.5 ± 15.0	35.6 ± 11.1	37.4 ± 10.6	0.48 _(3,69)	0.7
Age at onset (mean ± S.D.) ^{**}	22.8 ± 10.1	20.2 ± 8.1	18.5 ± 8.4	21.6 ± 10.2	0.7 _(3,62)	0.6
Length of illness (mean ± S.D.) ^{**}	17.1 ± 11.0	18.3 ± 16.2	18.4 ± 13.6	15.6 ± 10.3	0.2 _(3,61)	0.9
HDRS score (mean ± S.D.) ^{**}	10.4 ± 8.5	14.2 ± 8.5	18.0 ± 7.4	21.5 ± 8.3	6.7 _(3,69)	< 0.001
YMRS score (mean ± S.D.) ^{**}	7.0 ± 5.4	5.0 ± 7.1	10.4 ± 8.4	10.4 ± 6.1	2.3 _(3,69)	0.09
<i>Temperament traits</i> ^{***}						
Novelty seeking	24.1 ± 6.5	26.4 ± 4.5	20.6 ± 7.0	23.0 ± 6.6	2.6 _(3,65)	0.059
Harm avoidance	14.6 ± 7.6	17.5 ± 6.3	23.1 ± 6.0	21.7 ± 6.7	3.6 _(3,65)	0.017
Reward dependence	17.1 ± 4.0	14.4 ± 4.6	16.6 ± 3.2	14.5 ± 4.1	2.5 _(3,65)	0.064
Persistence	5.6 ± 2.1	3.3 ± 2.2	5.4 ± 2.3	4.8 ± 2.2	2.8 _(3,65)	0.047
<i>Character traits</i> ^{***}						
Self-directedness	30.5 ± 7.2	23.9 ± 6.6	21.6 ± 6.5	20.1 ± 7.9	4.8 _(3,65)	0.004
Cooperativeness	34.5 ± 6.0	30.3 ± 6.3	32.8 ± 4.8	28.5 ± 9.0	2.4 _(3,65)	0.074
Self-transcendence	18.0 ± 7.1	14.9 ± 8.0	20.9 ± 5.2	20.4 ± 7.0	1.7 _(3,65)	0.172

* Chi square test * Analysis of variance (ANOVA) test

** Analysis of covariance (ANCOVA) test, with age, gender, HDRS score and YMRS score as covariates

Abbreviations: TCI (Temperament and Character Inventory), HDRS (Hamilton Depression Rating Scale), YMRS (Young Mania Rating Scale)

Table 4

Summary of major findings of the TCI in controlled studies of bipolar disorder, alcohol/drug use disorders and anxiety disorders

Study	Sample size	Findings
<i>Bipolar disorder</i>		
Young et al., 1995	45 euthymic BD patients versus 100 age matched HC	↑ <i>novelty seeking</i> ↑ <i>harm avoidance</i>
Osher et al., 1996	50 euthymic BD patients*	↑ <i>harm avoidance</i> ↑ reward dependence ↓ persistence
Osher et al., 1999	25 euthymic BD patients versus 25 gender and ethnic matched HC	↓ novelty seeking ↓ persistence
Engstrom et al., 2004a	100 euthymic BD patients versus 100 age and gender matched HC	↑ <i>harm avoidance</i> ↓ reward dependence ↓ <i>self-directedness</i> ↓ <i>cooperativeness</i>
Evans et al., 2005	159 BD patients versus 63 HC**	↑ <i>novelty seeking</i> ↑ <i>harm avoidance</i> ↓ <i>self-directedness</i> ↓ <i>cooperativeness</i> ↑ <i>self-transcendence</i>
<i>Alcohol/drug use disorders</i>		
Basiaux et al., 2001	38 alcoholic patients versus 47 age and gender matched HC	↑ novelty seeking ↓ self-directedness
Le Bon et al., 2004	37 alcoholic patients versus 83 age matched HC	↑ novelty seeking ↑ <i>harm avoidance</i> ↓ self-directedness ↓ self-transcendence
Hosak et al., 2004	41 metamphetamine abusers versus 35 age and gender matched HC	↑ novelty seeking ↑ <i>harm avoidance</i> ↓ <i>persistence</i> ↓ self-directedness ↓ cooperativeness ↑ self-transcendence
<i>Anxiety disorders</i>		
Lyoo et al., 2001	40 obsessive-compulsive disorder patients versus age, gender and IQ matched HC	↓ novelty seeking ↑ <i>harm avoidance</i> ↓ <i>self-directedness</i>
Ball et al., 2002	120 patients with anxiety and depressive disorders versus 17 HC***	↑ <i>harm avoidance</i> ↓ <i>self-directedness</i>
Pelissolo et al., 2002	126 social phobia patients versus 602 subject-community sample	↑ <i>harm avoidance</i> ↓ <i>self-directedness</i> ↓ cooperativeness ↓ self-transcendence

Abbreviations: BD (bipolar disorder); HC (healthy controls). Those findings that are replicated by our present study are highlighted by our present study are highlighted in bold italic.

* No control group; comparisons made with general population (U.S. norms)

** Four subjects in the BD group had a diagnosis of schizoaffective disorder, bipolar type

*** *Post hoc* analyses showed that statistical differences in harm avoidance and self-directedness remained after comparing each separated group of anxiety disorder to the HC group