Personality trait predictors of bipolar disorder symptoms

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A B S T R A C T

The purpose of the current investigation was to examine the personality predictors of bipolar disorder symptoms, conceptualized as one-dimensional (bipolarity) or two-dimensional (mania and depression). A psychiatric sample (N = 370; 45% women; mean age 39.50 years) completed the Revised NEO Personality Inventory and the Minnesota Multiphasic Personality Inventory — 2. A model in which bipolar symptoms were represented as a single dimension provided a good fit to the data. This dimension was predicted by Neuroticism and (negative) Agreeableness. A model in which bipolar symptoms were represented as two separate dimensions of mania and depression also provided a good fit to the data. Depression was associated with Neuroticism and (negative) Extraversion, whereas mania was associated with Neuroticism, Extraversion and (negative) Agreeableness. Symptoms of bipolar disorder can be usefully understood in terms of two dimensions of mania and depression, which have distinct personality correlates.

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1. Introduction

Mania and depression have long been recognized as clinically relevant syndromes (see Mondimore, 2005): the inclusion of both classes of affective disturbance in one diagnostic entity, however, is a relatively recent nosological proposition (American Psychiatric Association, 1980). Criticisms of the union of mania and depression in a single diagnostic entity, and the identification of this entity as “bipolar” in nature, have accumulated. First, investigators cite that the presence of mania is the defining feature of bipolar disorder, rather than the presence of both mania and depression. Moreover, not all patients with bipolar disorder experience depressive episodes (Yazici et al., 2002), with estimates of greater than 20% of non-treatment-seeking bipolar individuals experiencing “unipolar mania” (Kessler et al., 1997). Second, the inclusion of mania and depression in a unitary illness implies that they reflect dysregulation along a single affective dimension (Cuellar et al., 2005); yet, empirical evidence for the existence of mixed episodes and the inaccuracy of describing mania and depression as opposite syndromes challenges such an assumption (Bauer et al., 1994; Power, 2005). Third, the distinction between bipolar and unipolar mood disorders intimates that a disparity exists between the depressive episodes experienced in these two disorders; however, the depressive episodes experienced by patients with these disorders are largely indistinguishable (Joffe et al., 1999; Cuellar et al., 2005). Thus, while patients may experience lifetime episodes of both mania and depression, the use of a bipolar disorder diagnosis to codify this affective disturbance may be misleading.

An alternative to the current differentiation between bipolar and unipolar disorders is the conceptualization of mania and depression as separate but related disorders. Schweitzer et al. (2005) suggest that episodes of elevated mood be identified as “manic disorder,” and episodes of depression as a common comorbidity. Genetic data support the contention that mania and depression are separable, but highly correlated syndromes (McGuffin et al., 2003). Mania and depression further have distinct courses of illness, associated features, treatment implications and prognoses (Joffe et al., 1999; Cuellar et al., 2005). The comorbidity of mania and depression might be conceptualized as related to both common and unique factors, a conceptual approach also applied to comorbid conditions such as anxiety and depression. As exemplified by the work of Watson (2005), dimensional personality traits can contribute to the delineation of the common and specific elements of psychopathology in such an approach, and may provide nosologically useful information in this regard.

1.1. Personality, mania and depression

The Five Factor Model (FFM) of personality is currently the most widely used and accepted comprehensive dimensional model of personality (Goldberg, 1990). The FFM posits that variation in personality can be understood in terms of five domains: Neuroticism, Extraversion, Openness-to-experience, Agreeableness, and Conscientiousness.
Neuroticism represents the tendency to experience negative affects and cognitions. Extraversion involves sociability, enthusiasm and assertiveness. Openness-to-experience includes aesthetic and intellectual curiosity and flexibility. Agreeableness involves trust, compassion and cooperativeness. Conscientiousness includes orderliness, diligence, and determination. The traits of the FFM are heritable (Reif and Lesch, 2003; Ebstein, 2006), and have been associated with a variety of important health outcomes including treatment response (Quilty et al., 2008; Bagby et al., 2008a,b). FFM traits may be etiologically related to psychopathology in a variety of ways (for example, vulnerability factors or associated features); regardless, they show promise of significant utility in clinical assessment and treatment, and the current reformulation of the psychopathological taxonomy (see Bagby et al., 2008a,b).

The traits of the FFM have been associated with bipolar disorder to a limited degree. Evidence suggests that bipolar disorder is associated with elevated Neuroticism as compared with normative samples, and with elevated Extraversion and Openness-to-experience as compared with other psychiatric groups (Bagby et al., 1997; Akiskal et al., 2006). It is of note, however, that these results are not consistently replicated (Carpenter et al., 1995; Jain et al., 1999). Evidence further suggests that manic and depressive symptoms are differentially associated with personality: Lozano and Johnson (2001) demonstrated that Neuroticism predicts depression within bipolar disorder, whereas (negative) Conscientiousness predicts mania. In a recent investigation, Murray et al. (2007) investigated the ability of the traits of the FFM to predict the tendency to experience affective dysregulation, conceptualized either as a unitary tendency towards bipolarity or as separate tendencies toward mania and depression. Murray and colleagues adopted a dimensional perspective, and utilized advanced statistical methodology in a sample of non-clinical, non-treatment-seeking undergraduate students. Neuroticism, Extraversion and (negative) Agreeableness significantly predicted the disposition towards bipolarity. Neuroticism predicted the disposition towards depression, whereas Extraversion and (negative) Agreeableness predicted the disposition towards mania. Thus, a two-dimensional model of bipolar disorder provided refined information regarding the personality traits associated with this disorder. As noted by Murray and colleagues, the extension of this line of inquiry to a clinical sample, and to current symptoms of mania and depression, would further clarify the personality correlates of bipolar disorder.

The current investigation undertook to extend this work within a treatment-seeking psychiatric sample, with a clinical measure of depressive and manic symptoms. Similar to Murray et al. (2007), we employ a dimensional framework and advanced statistical modeling. We utilize a general psychiatric sample with a variety of diagnoses to ensure a broad range of manic and depressive symptomatology. We further use a measure of current manic and depressive symptoms to promote the clinical utility of this investigation. The common and unique personality correlates of bipolar disorder symptomatology, conceptualized as a single dimension or as separable dimensions of mania and depression, were examined in separate models. Due to the consistent associations of bipolar disorder with Neuroticism and Extraversion (Bagby et al., 1997; Akiskal et al., 2006; Murray et al., 2007), we hypothesized that these traits would be predictive of a one-dimensional model of bipolar symptoms. Due to phenomenological similarities and established empirical associations (Bagby et al., 2008a,b), we further hypothesized that Neuroticism and low Extraversion would be associated with depressive symptomatology, while high Extraversion would be associated with manic symptomatology within a two-dimensional model of bipolar symptoms. In contrast, due to the inconsistent associations of mania with Extraversion, Agreeableness and Conscientiousness (Lozano and Johnson, 2001; Murray et al., 2007), we did not establish a priori hypotheses regarding which traits would be predictive of such symptoms.

2. Method

2.1. Subjects

Subjects were part of a large personality database maintained at a tertiary care, university-affiliated psychiatric centre. A total of 390 psychiatric patients provided informed consent and completed both the NEO PI-R and MMPI-2. Patients who provided invalid MMPI-2 profiles based on Cannot Say—30, VRIN or TRIN T > 80, and invalid NEO PI-R profiles based on > 41 items not endorsed were excluded. Twenty patients (5%) were excluded based on these criteria, resulting in a final sample of 370 (202 men and 168 women) patients. The mean age was 39.50 years (S.D. = 10.57). Most subjects self-identified as Caucasian and Canadian-born (84%), whereas the remaining participants self-identified as Canadians of Asian (4%), African (4%), or other/mixed (8%) descent. The most frequent primary Axis I diagnoses in this sample were depressive disorders (38%), anxiety disorders (26%) and bipolar disorders (5%: somatoform, psychotic, substance use, adjustment and dissociative disorders all < 5%). The present study was carried out in accordance with the latest version of the Declaration of Helsinki.

2.2. Measures

2.2.1. Revised NEO Personality Inventory (NEO PI-R; Costa and McCrae, 1992)

The NEO PI-R is a 240-item self-report questionnaire designed to measure the personality traits of the FFM, and to provide scores that correspond to the five broad factors of personality – Neuroticism (NEON), Extraversion (NEOE), Openness-to-experience (NEOD), Agreeableness (NEOA), and Conscientiousness (NEOC) (Costa and McCrae, 1992). Investigators have shown that the NEO PI-R is valid in psychiatric patients (Bagby et al., 1997, 1999), even in the context of acute symptom change (Costa et al., 2005; De Fry et al., 2006).

2.2.2. Minnesota Multiphasic Personality Inventory – 2 (MMPI-2; Butcher et al., 2001)

The MMPI-2 is a 567-item self-report questionnaire designed to identify clinically relevant signs of psychopathology (Butcher et al., 2001). The Restructured Clinical Scales of the MMPI-2 (RC; Tellegen et al., 2003) assess current symptoms of psychopathology and have demonstrated psychometric and conceptual improvement over the original Clinical Scales. This revised form of the clinical scales has 9 subscales, which may be used to assess for the reliability and validity of these scales across clinical settings (Tellegen et al., 2003, 2006; Sellbom et al., 2006; Forney and Ben-Porath, 2007). Restructured Clinical Scale 9 (Hypomania) provides an assess of factors of mania, including elevated mood, grandiosity, decreased need for sleep, racing thoughts, and risk-taking, and served as a measure of mania (MMPIMania). Restructured Clinical Scale 2 (Low Positive Emotions) provides an assay of distinct core components of depression such as anhedonia, whereas Restructured Clinical Scale 7 (Disfunctional Negative Emotions) provides an ass of negative affect and distress. In conjunction, these symptom dimensions have been argued and empirically supported to indicate depression (e.g., Watson, 2005). Thus, the sum of these scales served as a measure of depression (MMPIDepression). Similar to Murray et al. (2007), we utilize the sum of the measures of mania and depression to provide an assay of bipolar symptoms (MMPIBipolar).

2.3. Statistical analyses

We examined the association between the FFM traits and bipolar symptoms using the AMOS 6.0 structural equation modeling program (Arbuckle, 2005), applying the maximum likelihood method of estimation. Similar to Murray et al. (2007), we constructed a latent variables model, with one indicator for each latent construct (i.e. total scale score) corrected for measurement error. We (1) specified the error variance associated with each indicator as the product of its variance and 1 minus its alpha coefficient (S.D. × (1 – α)) and (2) set factor loadings using the formula S.D. × √α. The commencing model in each case included all possible paths. Goodness of fit was assessed using the following indices: χ², with associated P-values <0.05 indicating acceptable fit; Confirmatory Fit Index (CFI), with values <0.90 indicating acceptable fit; and Root Mean Square Error of Approximation (RMSEA), with values >0.10 indicating poor fit, <0.08 acceptable fit, and <0.05 close fit (Ullman, 1996; Hu and Bentler, 1999).

We evaluated three models. First, similar to Murray et al. (2007), we evaluated a model in which the five personality traits of the FFM served as correlated exogenous (predictor) variables, and the single clinical dimension of bipolarity served as an endogenous (criterion) variable. Second, we evaluated a model in which FFM traits served as correlated exogenous variables, and depression and mania served as reciprocally related endogenous variables. It is important to note, however, that the estimation of reciprocal effects within cross-sectional data requires the assumption of equilibrium – i.e. that the system is in a steady state, and estimated effects are not contingent on the time of assessment: “the causal process has basically dampened out and is not just beginning” (Kline, 2005, p. 239). Given the varied age and treatment status of patients in this sample, the time of assessment could have influenced values for a substantial proportion of patients. We thus evaluated a final model in which FFM traits served as correlated exogenous latent variables, and depression and mania served as unrelated endogenous variables. The lack of reciprocal pathways between depression and mania entails that this model makes no assumptions regarding the causal relations between depression and mania. For all models, models were adjusted on the basis of non-significant regression coefficients and modification indices.
3. Results

3.1. Descriptive and correlational analyses

The mean, range and standard deviation of the personality and clinical variables are displayed in Table 1. The internal reliability (coefficient α), error variances and factor loadings of the personality and clinical variables are also displayed in Table 1. Multivariate normality can be assessed through the inspection of univariate distribution index values, with univariate skew indexes greater than 3.0 and kurtosis indexes greater than 8.0 indicative of unacceptable non-normality (Kline, 2005). Skew and kurtosis indices for all scales were under 1. Internal reliability was adequate for all measures.

The bivariate correlations between the personality and clinical variables are displayed in Table 2. Neuroticism, Extraversion and Conscientiousness were strongly correlated with depression; in contrast, Agreeableness was strongly correlated with mania. Neuroticism and Conscientiousness were most strongly associated with bipolarity. Depression and mania were only modestly correlated.

3.2. Structural equation modeling

First, we evaluated the model in which the five personality traits of the FFM served as correlated exogenous variables, and the single clinical dimension of bipolarity served as an endogenous variable. The saturated model was “just-identified” (e.g., the number of parameters to be estimated was equal to the degrees of freedom) and the fit was necessarily perfect (χ² = 0.00, df = 0, P = 0.01; CFI = 1.00; RMSEA = 0.00). Three paths were removed on the basis of non-significant regression coefficients, resulting in a poor fitting model by most indices (χ² = 31.05, df = 8, P < 0.05; CFI = 0.90; RMSEA = 0.15). The model was adjusted on the basis of modifications indices. We attended to only those modifications which were theoretically defensible; namely, the adjustment of factor loadings to 1. The specification of factor loadings conducted by Murray et al. (2007) may therefore have placed excessive constraints upon the model, and resulted in an overly rigorous test of goodness of fit for those indices, which penalized for model complexity. This adjustment resulted in an acceptable fitting model by all indices (χ² = 4.20, df = 3, P > 0.05; CFI = 0.99; RMSEA = 0.06). This final model is displayed graphically in Fig. 1, and suggests that two personality traits – Neuroticism and (negative) Agreeableness – are associated with one-dimensional bipolarity.

Second, we evaluated the model in which FFM traits served as correlated exogenous variables, and depression and mania served as reciprocally related endogenous variables. The saturated model was again just-identified. Seven paths were removed on the basis of non-significant regression coefficients, and factor loadings were adjusted to 1, resulting in an acceptable fitting model by most indices (χ² = 26.21, df = 6, P < 0.05; CFI = 0.98; RMSEA = 0.09). This model is displayed in Fig. 2, and indicates that Neuroticism is associated with depression, whereas Extraversion and (negative) Agreeableness are associated with mania. Further, significant reciprocal relationships exist between depression and mania, such that depression positively predicted mania and mania negatively predicted depression.

Finally, we evaluated the model in which FFM traits served as correlated exogenous variables, and depression and mania served as endogenous variables. The saturated model was just-identified. Five paths were removed on the basis of non-significant regression coefficients, and factor loadings were adjusted to 1, resulting in an acceptable fitting model by most indices (χ² = 19.08, df = 6, P < 0.05; CFI =

Table 1
Descriptive data for personality and clinical variables.

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>S.D.</th>
<th>Range</th>
<th>α</th>
<th>Error variance</th>
<th>Factor loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neuroticism</td>
<td>104.13</td>
<td>29.42</td>
<td>16–174</td>
<td>0.95</td>
<td>43.28</td>
<td>28.68</td>
</tr>
<tr>
<td>Extraversion</td>
<td>93.72</td>
<td>24.87</td>
<td>27–173</td>
<td>0.92</td>
<td>49.48</td>
<td>23.85</td>
</tr>
<tr>
<td>Openness</td>
<td>105.74</td>
<td>20.54</td>
<td>57–175</td>
<td>0.89</td>
<td>46.41</td>
<td>19.38</td>
</tr>
<tr>
<td>Agreeableness</td>
<td>126.29</td>
<td>19.12</td>
<td>69–181</td>
<td>0.89</td>
<td>40.21</td>
<td>18.04</td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>110.03</td>
<td>23.71</td>
<td>31–167</td>
<td>0.92</td>
<td>44.97</td>
<td>22.74</td>
</tr>
<tr>
<td>Mania</td>
<td>9.29</td>
<td>5.12</td>
<td>0–27</td>
<td>0.83</td>
<td>4.46</td>
<td>4.66</td>
</tr>
<tr>
<td>Bipolarity</td>
<td>29.91</td>
<td>10.76</td>
<td>4–58</td>
<td>0.89</td>
<td>12.74</td>
<td>10.15</td>
</tr>
</tbody>
</table>

Table 2
Correlations between personality and clinical variables.

<table>
<thead>
<tr>
<th></th>
<th>Neuroticism</th>
<th>Extraversion</th>
<th>Openness</th>
<th>Agreeableness</th>
<th>Conscientiousness</th>
<th>Depression</th>
<th>Mania</th>
<th>Bipolarity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neuroticism</td>
<td>−0.58**</td>
<td>−0.07</td>
<td>0.52**</td>
<td>−0.28**</td>
<td>0.05</td>
<td>−0.18**</td>
<td>−0.13**</td>
<td>−0.40**</td>
</tr>
<tr>
<td>Extraversion</td>
<td>−0.58**</td>
<td>−0.45**</td>
<td>−0.18**</td>
<td>−0.49**</td>
<td>−0.21**</td>
<td>0.36**</td>
<td>0.40**</td>
<td>0.38**</td>
</tr>
<tr>
<td>Openness</td>
<td>−0.58**</td>
<td>−0.45**</td>
<td>−0.18**</td>
<td>−0.49**</td>
<td>−0.21**</td>
<td>0.36**</td>
<td>0.40**</td>
<td>0.38**</td>
</tr>
<tr>
<td>Agreeableness</td>
<td>−0.58**</td>
<td>0.05</td>
<td>0.36**</td>
<td>0.12**</td>
<td>−0.06</td>
<td>−0.34**</td>
<td>−0.42**</td>
<td>0.88**</td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>−0.58**</td>
<td>−0.45**</td>
<td>−0.18**</td>
<td>−0.49**</td>
<td>−0.21**</td>
<td>0.36**</td>
<td>0.40**</td>
<td>0.38**</td>
</tr>
<tr>
<td>Depression</td>
<td>−0.58**</td>
<td>−0.45**</td>
<td>−0.18**</td>
<td>−0.49**</td>
<td>−0.21**</td>
<td>0.36**</td>
<td>0.40**</td>
<td>0.38**</td>
</tr>
<tr>
<td>Mania</td>
<td>−0.58**</td>
<td>−0.45**</td>
<td>−0.18**</td>
<td>−0.49**</td>
<td>−0.21**</td>
<td>0.36**</td>
<td>0.40**</td>
<td>0.38**</td>
</tr>
<tr>
<td>Bipolarity</td>
<td>−0.58**</td>
<td>−0.45**</td>
<td>−0.18**</td>
<td>−0.49**</td>
<td>−0.21**</td>
<td>0.36**</td>
<td>0.40**</td>
<td>0.38**</td>
</tr>
</tbody>
</table>

Note. *P < 0.05, **P < 0.01.
0.99; RMSEA = 0.08). This model is displayed in Fig. 3, and indicates that Neuroticism and (negative) Extraversion are associated with depression, whereas Neuroticism, Extraversion and (negative) Agreeableness are associated with mania.

4. Discussion

The current investigation served as an extension of the work of Murray et al. (2007), and sought to investigate the common and unique personality predictors of bipolar disorder symptoms, conceptualized as both one- and two-dimensional, in a psychiatric sample. All models provided a good fit to the data within a psychiatric sample. These results provide insight into the heuristic value of personality traits in the understanding and conceptualization of bipolar disorder symptomatology.

Consistent with the work of Murray et al. (2007) and others, Neuroticism and (negative) Agreeableness were strongly associated with the symptoms of bipolar disorder, conceptualized as a single dimension. Further, Neuroticism was strongly associated with the symptoms of depression, whereas Extraversion and (negative) Agreeableness were associated with the symptoms of mania, in a two-dimensional conceptualization. In stark contrast to Murray and colleagues, however, the reciprocal relationships between depression and mania were opposite in sign, such that depression positively predicted mania and mania negatively predicted depression. This pattern of results may be understood with reference to the differences between the design of the work of Murray and colleagues and the current investigation. First, Murray and colleagues, using the General Behavior Inventory (Depue et al., 1989), examined the stable disposition towards depression and mania, which were highly correlated (0.83). In contrast, the current investigation, using the MMPI-2, examined current manic and depressive symptoms, which were modestly related (0.18). Second, Murray and colleagues assessed non-clinical young adults, in accordance with their emphasis on dispositions towards affective difficulty in healthy samples. In contrast, the current investigation assessed a psychiatric sample, with a relatively broad age range, due to our emphasis on traits predictive of current affective symptoms. The modeling of reciprocal pathways within the current design may have been problematic, as the assumption of equilibrium may be less tenable within our sample. Replication within a patient sample following optimal titration of medication or sampling procedures sensitive to clinical characteristics may allow a more defensible and reliable estimate of reciprocal associations.

Thus, within our final model, which does not explicitly model the causal relations between depression and mania, Neuroticism and (negative) Extraversion were associated with depression, and Neuroticism, Extraversion and (negative) Agreeableness were associated with mania. This parsimonious model is highly consistent with the literature regarding the personality correlates of depression (e.g., Watson, 2005; Brown, 2007; Bagby et al., 2008a,b). Mania has been more variably associated with the traits of the FFM (e.g., Bagby et al., 1997; Lozano and Johnson, 2001; Murray et al., 2007). Yet, the excitement-seeking, activity and positive affectivity subsumed within Extraversion, and the lack of compliance, modesty and interpersonal trust subsumed within (negative) Agreeableness, are consistent with the symptoms and associated features of manic episodes (Costa and McCrae, 1992).

The two-dimensional model of bipolar illness thus produced a refined view of the personality traits associated with bipolar disorder. Neuroticism was associated with bipolar symptoms as a whole, as well as both depression and mania. Extraversion was not associated with bipolar symptoms as a whole, likely due to its differential relations with depression and mania: Extraversion was negatively associated with depression (in line with the predominance of anhedonia in the phenomenology of depressive episodes) and positively associated with mania (in line with the heightened activity, euphoria and sensation seeking associated with manic episodes). Although
Agreement was associated with bipolar symptoms as a whole, the two-dimensional model of bipolar illness clarified that this trait was uniquely associated with manic symptoms. In contrast to earlier investigations (e.g., Bagby et al., 1997), there was no evidence of an association between Openness-to-experience and Conscientiousness and bipolar symptoms. Further research utilizing longitudinal research designs and comparison groups may help to ensure that a sufficiently broad range of these traits are represented within the sample to be studied, and to elucidate the potential etiological role of these and other personality traits.

The strengths of the current investigation include the association of traits from a robust, comprehensive model of personality with the symptoms of bipolar disorder, conceptualized as one or two dimensions, within a heterogeneous psychiatric sample. Both a one- and two-dimensional model of bipolar symptomatology provided an adequate fit to a model relating personality to bipolar symptoms. However, the two-dimensional model provided a more differentiated view of the associations of personality and bipolar symptoms, more attuned with conceptual and empirical thinking in personality and psychopathology.

This investigation does have a number of limitations, however. First, we were unable to investigate how variables related to patient premorbid personality functioning, and additional demographic and clinical characteristics, such as culture or family psychiatric history, may have influenced study results, due to the absence of such information. Second, we utilized a single psychiatric assessment instrument and sample. Although the MMPI-2 has been extensively validated in psychiatric samples, replication with additional measures of depressive and manic symptomatology would be helpful. Further, replication with additional populations likely to demonstrate varied bipolar symptomatology, such as purely bipolar patient samples and community samples, would be beneficial. Finally, the cross-sectional nature of the current investigation precludes causal conclusions (Christensen and Kessing, 2006). Indeed, longitudinal investigations of personality, mania and depression are required to establish which etiological model of these constructs is appropriate.

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