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Cognitive Styles in Mood Disorders: Discriminative Ability of Unipolar and Bipolar Cognitive Profiles

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Abstract

Although previous research has identified cognitive styles that distinguish individuals with bipolar disorder (BD), individuals with major depressive disorder (MDD), and individuals without mood disorders from one another, findings have been inconsistent. The current study included 381 participants classified into a BD group, a MDD group, and a no mood disorder group. To differentiate between these groups, this study evaluated cognitive styles with a battery of traditional and more recently-developed measures. Receiver operating characteristics (ROC) analyses were used to determine the discriminate ability of variables with significant between group differences. Results supported that BD and MDD may be characterized by distinct cognitive styles. Given work showing that interventions for MDD may not be effective at treating BD, it is

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important to directly compare individuals with these disorders. By clarifying the overlapping and divergent cognitive styles characterizing BD and MDD, research can not only improve diagnostic validity, but also provide more efficacious and effective interventions.

Keywords

Diagnostic Specificity; Bipolar Disorder; Major Depressive Disorder; Cognitive Styles

Mood disorders are among the most prevalent psychiatric disorders and are associated with substantial distress and impairment. Major depressive disorder (MDD), characterized by depressive episodes that are often recurrent (Boland & Keller, 2009), is the most common mental disorder worldwide with an estimated lifetime prevalence of 16.6% (Kessler et al., 2005). Due to significant social and occupational impairment and considerable comorbidity with other psychiatric conditions, MDD often results in major personal, economic, and societal costs (Kessler et al., 2006; Kessler & Wang, 2009). Similarly, bipolar spectrum disorders (BD) constitute a class of severe and chronic mood disorders characterized by periods of depression and periods of mood elevation or irritability which occurs in 4.4% of the U.S. population (Merikangas et al., 2007). BD is the sixth leading cause of disability worldwide (Murray & Lopez, 2006) and is associated with impairment in many areas of functioning, including poor academic and work achievement, substance abuse, divorce, and suicide (e.g., Angst, Stassen, Clayton, & Angst, 2002; Grant et al., 2004; Kessler et al., 2006). Thus, identifying characteristics of individuals at risk for mood dysfunction and impairment associated with MDD and BD is an important area of ongoing research (Akiskal, 1996; Bowden, 2005).

Achieving differentiation between MDD and BD and its risk factors remains an important aim of clinical research as these disorders share many features (Bowden, 2005). Diagnostic accuracy at the time of an initial episode is particularly important as delayed diagnosis or misdiagnosis can lead to delayed treatment, and the potential for inappropriate treatment. It is not surprising, however, that differential diagnosis between MDD and BD is problematic as many BD individuals (with bipolar II or bipolar I) experience onset of a depressive episode before the onset of an episode of hypomanic or manic mood elevation, and thus, may be initially diagnosed with MDD (Akiskal, 1995; Angst et al., 2005; Hirschfeld et al., 2003). Indeed, some research estimates that as many as 40% of patients with BD are initially misdiagnosed and may not be correctly re-diagnosed for up to 8 to 10 years after the initial diagnosis (Hirschfeld et al., 2003; Lish et al., 1994). As treatments for MDD and BD differ substantially, and treatment for MDD in bipolar individuals includes the potential for antidepressant-induced mania (Altshuler et al., 1995; Ghaemi et al., 2001; Wehr & Goodwin, 1987) and delays in efficacious treatment with mood stabilizers (Goldberg & Ernst, 2002), it is important to be able to identify indicators of bipolarity, even if an individual's presenting problem is an episode of depression (Watson et al., 2011). The purpose of the current study is to identify cognitive style markers that may help to distinguish between individuals with BD and those with MDD. Importantly, research and theory suggests that cognitive styles may both be a vulnerability factor for mood episodes and a scar from mood dysfunction as well (Joiner et al., 2003; McCarty, Vaander Stoep, &

McCauley, 2007). Inasmuch as these cognitive features predict mood episodes, they also may become more dysfunctional after an episode of depression or mania. A more advanced understanding of the cognitive differences between BD and MDD would foster a better conceptualization of differences between these groups, and might allow clinicians to direct more careful diagnostic assessments toward individuals whose cognitive styles indicate that they may have a BD.

In addition to improving diagnostic accuracy, identifying cognitive style markers of MDD and bipolarity also has implications for tailoring psychosocial treatments. Given the similarities between depressive episodes in BD and MDD, cognitive behavioral therapy (CBT) interventions for BD are largely drawn from empirically validated CBTs for MDD (e.g., Scott et al., 2001). However, results of CBT studies for BD have not consistently shown these techniques to be effective in treating depressive symptoms in BD (e.g., Scott et al., 2006). Some researchers have hypothesized that existing inconsistencies in the effectiveness of CBT for BD are the result of an incomplete and inaccurate understanding of the cognitive styles that distinguish BD from MDD (Lam, 2006). Indeed, current cognitive-behavioral conceptualizations and treatments for BD might be better informed if the cognitive styles specific to BD were better understood.

Existing research evaluating characteristics that distinguish BD from MDD has been inconsistent (Watson et al., 2011), with some studies reporting few differences between the disorders (Cuellar, Johnson, & Winters., 2005; Weinstock et al., 2009), and others reporting a number of variables that distinguish BD from MD, including earlier age of onset, family history of BD, and greater number of prior depressive episodes (Mitchell et al., 2008). Importantly, much of the existing research examining the differences between MDD and BD has focused on differences in the symptomatology and course of disorder (e.g., Bowden, 2005; Hantouche & Akiskal, 2005). Inasmuch as our understanding of the role of cognition in BD was extended from earlier literature on cognition in MDD (Alloy et al., 2010), few tools have been specifically developed to cognitively differentiate BD from MDD (e.g., Angst et al., 2005, Hirschfeld et al. 2000, Miller et al., 2004, Watson et al., 2011) and those that have been developed provide an incomplete understanding of the cognitive style profile exhibited by individuals with BD. Thus, it is important to continue to identify cognitive styles that differentiate individuals with BD from those with MDD.

Theoretically, individuals with MDD and BD have different cognitive styles and interact with their world in different ways. Whereas individuals with MDD may be more likely to interpret stressful life events in a negatively valenced manner and be more susceptible to experiencing depressive symptoms in response to negative life events, individuals with BD may be susceptible to both positive and negative events and react extremely on both dimensions of emotion (Cuellar et al., 2005). Individuals who are prone to BD may have similar reactions to negative life events (Cuellar et al., 2005), but also may be inordinately influenced by positive life events, such as goal attainment events, which may elicit hyperreactivity to reward (Alloy & Abramson, 2010). Taken together, one would expect individuals with BD to demonstrate cognitive styles that are activated by both positive and negative events, whereas those with MDD should only exhibit negatively-valenced cognitive styles (Johnson, 2005b). Although the focus of the current study is to examine which

cognitive styles can differentiate between individuals with a history of BD versus MDD, much of the existing literature has compared each of these diagnoses to healthy controls, which can help to inform the current hypotheses. In addition, several new measures of cognitive styles relevant to BD have been developed in recent years (e.g., Eisner et al., 2008; Feldman et al., 2008; Johnson & Carver, 2006; Treynor et al., 2003), and few studies have demonstrated whether these new measures can effectively differentiate individuals with BD from non-mood disordered individuals (or from individuals with only a history of depression; e.g., Johnson, Eisner, & Carver, 2009). Thus, the following sections review studies that have compared the cognitive styles of BD, MDD, and non-mood comparison individuals.

Cognitive Style Differences between MDD and Non-mood Disordered Individuals

A number of studies have found that individuals with MDD differ from healthy controls on several cognitive variables. Consistent with Beck's cognitive theory of depression (Beck, Rush, Shaw, & Emery, 1979), MDD is associated with higher levels of dysfunctional attitudes even outside of depressive episodes (Dozois & Beck, 2008; Goldberg et al., 2008; Jones et al., 2005). Individuals with a history of MDD have high levels of self-criticism (Rosenfarb, Becker, Khan, & Mintz, 1998); self-criticism differentiates formerly depressed from never-depressed individuals after controlling for current symptoms of depression (Hartlage, Arduino, & Alloy, 1998). Additionally, MDD has been associated with rumination, the tendency to repeatedly think through the causes of one's depressed mood (Nolen-Hoeksema, 1991), which has been shown to be an important risk factor in the onset and maintenance of depressive episodes (Abela & Hankin, 2011; Nolen-Hoeksema 2000a, b; Spasojevic & Alloy, 2001) and to be elevated in individuals with a history of MDD (Johnson, McKenzie, & McMurrich, 2008; McMurrich & Johnson, 2008; Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). Similarly, private self-consciousness (i.e., concern with attending to one's inner thoughts and feelings) has also been associated with depression in a number of studies (Fenigstein, Scheier, & Buss, 1975; Musson & Alloy, 1988; Ruiperez & Belloch, 2003).

Cognitive Style Differences between BD and Non-mood Disordered Individuals

Several domains of cognitive style have been shown to differentiate individuals with or at risk for BD from healthy controls (e.g., Mansell & Jones, 2006). BD has been associated with hypersensitivity of the Behavioral Approach System (BAS), the motivational system hypothesized to underlie the pursuit of goals and responsiveness to rewards (Gray, 1994). Several studies have indicated that individuals with BD have higher levels of BAS sensitivity than do healthy controls (Alloy et al., 2006, 2008; Salavert et al., 2007; Van der Gucht et al., 2009); this may result in excessive activation and hypomania or mania when activated (e.g., by positive or goal-striving life events), or to depression when deactivated (e.g., by events resulting in loss or failure (Nusslock et al., 2007; Urosevic, Abramson, Harmon-Jones, & Alloy, 2008). Consistent with the BAS hypersensitivity model of BD,

individuals with and at risk for BD have been shown to set higher goals and have higher ambitions for fame, wealth, and political influence than other individuals (Johnson & Carver, 2006; Johnson, Ruggero, & Carver, 2005; Stange et al., 2013; for a review, see Johnson, 2005a). Individuals with or at risk for BD also have been differentiated from healthy controls by having higher levels of risk-taking (e.g., Carver & Johnson, 2009; Johnson & Jones, 2009), autonomy (Alloy et al., 2009b; Van der Gucht et al., 2009), self-criticism (Alloy et al., 2009b; Rosenfarb et al., 1998), and dysfunctional attitudes, particularly those relevant to perfectionism and performance evaluation (Alloy et al., 2009b; Jones et al., 2005; Lam, Wright, & Smith, 2004; Scott, Stanton, Garland, & Ferrier, 2000; Stange et al., 2013). Finally, BD and risk for BD also have been characterized by higher levels of private self-consciousness (Alloy et al., 2009a) and rumination about both negative (Gruber et al., 2011; Johnson et al., 2008; Stange et al., 2013) and positive affect (e.g., Feldman, Joorman, & Johnson, 2008; Gruber et al., 2011).

Cognitive Style Differences between BD and MDD

In general, the literature comparing BD to MDD has been mixed, in part due to methodological differences in reporting cognitive styles with versus without controlling for concurrent mood symptoms. Studies have documented similarities in cognitive styles between BD and MDD (e.g., Scott et al., 2000), which might be expected given symptom overlap between the disorders. However, emerging literature has suggested that there also may be significant differences in cognitive styles between individuals with these disorders. Several studies have found that positive appraisals of elevated mood states and positive overgeneralization of success (Alatiq et al., 2010; Eisner et al., 2008), particularly in combination with negative appraisals of events (Kelly et al., 2011), distinguish BD and risk for BD from MDD. Individuals with BD exhibit higher expectancies of achieving popular fame and wealth (Johnson et al., 2009) and higher levels of maladaptive cognitions associated with mania than do those with MDD (Goldberg et al., 2005). Positive, emotion-focused rumination also has been shown to differentiate BD from MDD (Johnson et al., 2008), whereas most studies have found that rumination on negative affect does not differ between BD and MDD (Johnson et al., 2008; Manicavasagar et al., 2011; for an exception, see Thomas, Knowles, Tai, & Bentall, 2007; Kim et al., 2012). There are mixed results from studies comparing dysfunctional attitudes in individuals with BD and MDD, but overall levels appear to be comparable between groups (Goldberg et al., 2008; Jones et al., 2005; Manicavasagar et al., 2011; Scott & Pope, 2003; see Beck et al., 2006 for an exception) and in general, no differences have been found between BD and MDD groups in studies comparing levels of self-criticism, autonomy, and sociotropy (e.g., Scott & Pope, 2003). Finally, social avoidance has been shown to be more characteristic of MDD than of BD (Watson et al., 2011); no studies have compared private, public, or social self-consciousness between BD and MDD.

Thus, although several factors have been identified that distinguish between individuals with BD, those with MDD, and healthy individuals, results have been inconsistent (e.g. Goldberg et al., 2005). Previous studies typically have evaluated only one or two of these cognitive factors and also have exhibited methodological differences, which could explain the heterogeneity in findings. Therefore, in the present study, cognitive styles that differentiate

between these diagnoses were thoroughly evaluated, using a battery of traditional and more contemporary cognitive style measures. Importantly, cognitive styles both predict mood episodes and may also become more maladaptive after episodes of mood dysregulation (Joiner et al., 2003; McCarty et al., 2007), thus a more complete understanding of differences may enhance both prediction of first onset and subsequent reoccurrences of the disorders. As both BD and MDD may involve depressive episodes, in the present study, only participants with BD were included if they also had a history of depressive episodes to more clearly compare cognitive styles that may differentiate MDD from BD. As Cuellar and colleagues (2005) note, cognition during an episode of depression has often been found to be comparable between these groups. Thus, the cognitive differences or similarities that remain while both sets of individuals are currently in remission from mood episodes is generally unknown, but has value to inform diagnosis and treatment of each disorder. It was expected that individuals with BD would exhibit cognitive styles that are susceptible to both positive and negative events, whereas those with MDD would exhibit only negatively valenced cognitive styles. Therefore, it was hypothesized that individuals with BD would show more positive cognitions (i.e., positive overgeneralization and rumination about positive affect) than individuals with MDD and controls with no mood disorder. In addition, it was hypothesized that individuals with BD and MDD would show similar levels of negative cognitions (i.e., self-criticism and brooding) that would be greater than controls.

Method

Participants and Procedures

Participants for this study were 381 adolescents and young adults (ages 14–21; *M* = 18.33, *SD* = 1.44) recruited from the greater Philadelphia region. Participants were recruited from 13 Philadelphia public high schools during homeroom advisory periods (grades 9–12, ages 14–18), as well as from two universities (college students ages 17–19) through the dorms and the universities' online screening systems. To enhance the likelihood of recruiting a community sample that included individuals with BD, participants were initially selected based on their scores on two measures associated with BAS sensitivity—the Carver and White Behavioral Inhibition System/Behavioral Activation System (BIS/BAS) scales (Carver & White, 1994) and the Sensitivity to Punishment/Sensitivity to Reward Questionnaire (SPSRQ) (Torrubia et al., 2001). Participants were grouped into a moderate- or high- BAS activation group. Participants scoring in the 40^{th} to 60^{th} percentile on both the SPSRQ Reward subscale (Torrubia et al., 2001) and total BAS score on the BIS/BAS scales (Carver & White, 1994) were designated moderate BAS, and participants scoring at or above the 85^{th} percentile on both measures were designated high BAS. Of 9,991 students participated in the screening, 7.77% (n = 776) qualified for the high BAS group and 4.04% (n = 404) for the moderate BAS group. Individuals with high BAS were selected to be at a higher risk to develop BD, whereas those at moderate BAS are equally as likely to develop a mood disorder compared to the general population (Alloy et al., 2012). It is important to note that research suggests that those likely to develop unipolar depression would have low BAS scores (with some exceptions, e.g., Vergara & Roberts, 2011). Although this limits generalizability of the current sample, the selection criteria were used to maximize the possibility to have a community sample including individuals with a bipolar disorder.

In the second phase of screening, participants 18 or older completed consents. For adolescents under age 18, parents completed consents for their child, and the adolescents completed written assents. Participants then completed a semi-structured diagnostic interview, an expanded Schedule for Affective Disorders and Schizophrenia-Lifetime version (SADS-L) (Endicott & Spitzer, 1978), to assess their lifetime history of psychopathology. Participants were excluded from the larger study if they had a lifetime history of any psychotic disorder or if they were not fluent in English. The full sample from which the current study selected participants consisted of 427 individuals. The reduction in sample size to the current sample was due to missing data; participants included in the current sample were not different from those not included based on demographic characteristics and diagnostic status. In addition, some participants had missing values on some measures, but this was below 5% of the sample. Missingness did not differ between groups.

For the current study, participants who met criteria for Diagnostic and Statistical Manual of Mental Disorders, 4th edition revised (DSM-IV-TR; American Psychiatric Association, 2000) or Research Diagnostic Criteria (RDC; Spitzer, Endicott & Robbins, 1978) diagnosis of bipolar I disorder or bipolar II disorder were included in the bipolar group (n = 31: 19% bipolar I). Participants who met DSM-IV-R or RDC criteria for major depressive disorder were included in the unipolar depression group (n = 122). All participants in the diagnostic groups had a lifetime history of their disorder. Participants were euthymic as no participants met criteria for a current depressive or manic/hypomanic episode at the time of data collection (remission was determined by having at least 2 months of not meeting full criteria for diagnosis). Participants without a history of mood disorders were included in the control group (n = 228). Other diagnoses were not screened out for the control group and the two mood disorders groups (e.g., anxiety disorders). The demographic characteristics (age, gender, race) of the participants included in the current study did not significantly differ from that of the full sample participating in the second phase of screening. Participants in all groups completed several self-report measures described below. The overall mean for each measure is presented in Table 1 and the mean for each measure broken down by group is presented in Table 2.

Measures

Altman Self-Rating Mania Scale—The Altman Self-Rating Mania Scale (ASRM; Altman, Hedeker, Peterson, & Davis, 1997) is a 5-item self-report questionnaire that assesses symptoms of hypomania and mania, e.g., reduced need for sleep, excessive activity, and euphoria. Total scores on the ASRM have been highly correlated with semi-structured interview diagnoses of mania and hypomania and other self-report measures of manic symptoms (Altman, Hedeker, Peterson, & Davis, 2001). As all participants in the current study were euthymic at the time of the assessment, the ASRM was utilized to assess subsyndromal symptoms of hypomania. The internal consistency in the current sample was $\alpha = .75$.

Beck Depression Inventory—The Beck Depression Inventory (BDI; Beck et al., 1979) is a widely used, 21-item questionnaire assessing depressive symptoms. It includes items

assessing mood, appetite changes, suicidality, somatic preoccupation, and functional impairment. The validity and reliability of the BDI have been well established (see Beck, Steer & Garbin, 1988, Beck et al., 1996; Whisman, Perez, & Ramel, 2000). As participants were excluded from the current study if they were experiencing a depressive or manic/hypomanic episode at the time of assessment, the BDI was utilized to capture subsyndromal depressive symptoms. The internal consistency in the current sample was $\alpha = .87$.

Willingly Approached Set of Statistically Unlikely Pursuits—The Willingly Approached Set of Statistically Unlikely Pursuits (WASSUP; Johnson & Carver, 2006) is a self-report measure of the tendency to set extremely ambitious goals (e.g., "You will be president of your country"; "You will have 20 million dollars or more.") in each of 7 domains: Partner & Family, Friends, Popular Fame, Political Influence, World Well-Being, Creation/Fulfillment, and Financial Success. Previous research has demonstrated associations between elevations in the popular fame, financial success, and political influence domains and risk for bipolar disorder (Alloy et al., 2012; Johnson & Carver, 2006) as well as history of mania and/or hypomania (Johnson et al., 2009). In the current study, the WASSUP was used to assess ambitious goal striving, a subtype of approach motivation which is thought to be particularly relevant in bipolar spectrum disorders (Johnson & Carver, 2006; Johnson et al., 2012). Consistent with previous research (Johnson, Carver, & Gotlib, 2012), alphas were in the moderate range for the creation/fulfillment and political influence subscales (both α's = .61) and were higher for the partner/family, popular fame, and world well-being subscales ($\alpha = .72–.90$). In the current sample, however, internal consistency for the financial success subscale ($\alpha = .72$) was higher and internal consistency for the friends subscale ($\alpha = .68$) lower than in prior work using this measure (e.g., Johnson et al., 2012).

Positive Overgeneralization Scale—The Positive Overgeneralization Scale (POG; Eisner et al., 2008) is an 18-item self-report questionnaire used to assess the tendency to generalize success from one experience to other aspects of life. The POG was used in the current study to assess one dimension of an "overly positive" cognitive style, which is thought to confer risk for bipolar spectrum disorders (Johnson & Jones, 2009; Stange et al., 2012). The POG is comprised of three subscales: Upward Generalization, which measures the tendency to expect success in achieving loftier goals within the same domain of an initial success (e.g., "If someone praises the way I express something, it makes me think I can write a popular book"); Lateral Generalization, which measures generalization from success in one domain to successes in other domains (e.g., "If I succeed at something, it makes me feel I will succeed in other areas as well"); and Social Generalization, which measures generalization from positive social interactions (e.g., "When someone compliments me about something I've said, it makes me think about impressing lots of other people"). Positive overgeneralization is associated with hypomanic personality traits (Eisner et al., 2008) and has been shown to prospectively predict hypomanic symptoms in individuals with high BAS sensitivity (Stange et al., 2012). The Upward, Lateral, and Social Generalization subscales had internal consistencies of α's = .72, .71, and .71, respectively.

Self-Consciousness Scale—The Self-Consciousness Scale (SCS; Fenigstein, Scheier, & Buss, 1975) is a self-report measure that assesses individual differences in self-focused attentional tendencies and is comprised of three subscales: Public Self-Consciousness, which reflects a person's awareness of him or herself as viewed by other people; Private Self-Consciousness, which reflects a person's awareness of his or her own internal states, cognitions and emotions; and Social Anxiety, which reflects the tendency to become anxious when in the presence of others. In the current sample, the Public Self-Consciousness, Private Self-Consciousness, and Social Anxiety subscales had internal reliabilities of α's = .78, .63, and .76, respectively.

Responses to Positive Affect Scale—The Responses to Positive Affect Scale (RPAS; Feldman et al., 2008) is a 17-item self-report questionnaire that assesses cognitive responses to positive affective states. Three factors comprise the RPAS: Emotion-Focused, rumination on positive moods and the physiological experience of positive affect; Self-Focused, rumination on personal characteristics and personally relevant goals; and Dampening, thoughts that attenuate positive emotion. Previous research has suggested that high levels of rumination on positive affect may be a component of an overly positive cognitive style associated with hypomanic symptoms and bipolar spectrum diagnoses (Carver & Johnson, 2009; Feldman et al., 2008; Johnson, McKenzie & McMurrich, 2008). In the current sample, the internal reliabilities of the Emotion-Focused, Self-Focused, and Dampening subscales were α's = .77, .77, and .83, respectively.

Ruminative Response Scale- Brooding and Reflective Pondering—The Ruminative Response Scale-Brooding and Reflective Pondering (RRS-BR; Treynor et al., 2003) is comprised of 22 items assessing the frequency with which individuals experience specific cognitive responses to sad or depressed mood. In the current study, the RRS-BR was used to assess rumination on negative affect. Negative rumination, and more specifically brooding, has been associated with increases in negative affect in depressed, bipolar, and non-clinical samples, and appears to result in amplification of negative affect across depressive as well as euthymic mood states (Alloy et al., 2009b; Arger, Sanchez, Simonsen, & Mezulis, 2012; Gooding, Taylor, & Tarrier, 2012; Gruber, Eidelman, Johnson, Smith, & Harvey, 2011; Kim, Yu, Lee, & Kim, 2012; Moberly & Watkins, 2008; Nolen-Hoeksema et al., 2008; Siegle, Moore, & Thase, 2004; Treynor et al., 2003). The RRS-BR is a subset of 10 items from the RRS with those items that are specific to depressive symptoms removed. The RRS indexes two theoretically distinct types of rumination on negative affect; the RRS Reflective Pondering subscale assesses the degree to which individuals engage in introspection and reflection, while the RRS Brooding subscale assesses the extent to which individuals tend to engage in "moody pondering" (Treynor et al., 2003). In the current sample, the internal consistency of the Brooding subscale was α = .82, and of the Reflective Pondering subscale was α = .75.

Depressive Experiences Questionnaire—The Depressive Experiences Questionnaire (DEQ; Blatt, D'Afflitti, & Quinlan, 1976) is a 66-item survey of experiences associated with, but not symptoms of, depression. In the current study, the DEQ was used to assess personality differences associated with differential risk for depression. The DEQ is

comprised of three subscales: Dependency, which measures feelings of helplessness and neediness in interpersonal relationships; Self-Criticism, which measures negative self-evaluations; and Efficacy, which measures self-confidence, independence and pride. The DEQ-Dependency and DEQ-Self Criticism subscales are positively correlated with depressive symptoms; the DEQ-Efficacy scale has a negative correlation with symptoms of depression (Blatt et al., 1976). In the present study, the Dependency, Self-Criticism, and Efficacy subscales had internal consistencies of α's =.73, .79, and .73, respectively.

Results

Data Analytic Procedures

A two-tiered analytic approach was used to examine cognitive style differences between the three groups. First, a multivariate analysis of covariance (MANCOVA) was employed to test for overall mean differences between the three diagnostic groups. MANCOVA takes into account the pattern of covariation among the dependent measures, and in this study, there is likely overlap between the cognitive styles (Table 1). MANCOVA is sensitive not only to mean differences, but also to the direction and size of correlations among the dependent variables. In this way, MANCOVA can help control for the inflation of Type I error rates. Given the nonrandom assignment of participants to diagnostic group, covariates were included in the MANCOVA to improve the power to test the effects of the group independent variable (Miller & Chapman, 2001). Group differences were examined to see if they were significantly correlated with symptoms at baseline, sex, race, or age; when so, that variable was controlled in the omnibus MANCOVA. Given the nonrandom selection of participants, analysis controlling for BAS risk status was conducted.

Second, the results of the MANCOVA guided Receiver Operator Characteristics (ROC) analyses. When the main group effect for cognitive styles in the MANCOVA was significant, ROC analyses were used to examine the predictive power of the cognitive styles to differentiate between diagnostic groups. Traditionally, the mean score of an individual with a particular disorder is compared to the mean score of an individual without the disorder (e.g., *t*-test, ANOVA, Discriminant Function Analysis), but these tests do not effectively answer questions about diagnostic accuracy (Meehl & Rosen, 1955). As Youngstrom (2014) describes, ROC analysis instead examines diagnostic categories as the dependent variable and the test scores as the predictor. Importantly, ROC analysis examines the trade-off between the specificity and sensitivity of a measure to distinguish between groups, and thus, can be a helpful measure of discrimination. In addition, ROC analyses are a multivariate statistical procedure that is independent of the assumption of normality; scores can be quite skewed without affecting accuracy. ROC analyses also are robust against unequal sample sizes. As a consequence, ROC analyses are better able to discriminate between individuals with and without the disorder and may be used with unequal sample sizes. ROC accuracy is determined by area under the curve (AUC), a measure of effect size; an AUC of .50 suggests the test score in question does no better than chance at differentiating between diagnostic groups, whereas an AUC of 1.00 signifies perfect accuracy. Conventionally, researchers have offered benchmarks for acceptable AUC values with scores above .9 as excellent, above .8 good, and above .7 as fair (Kraemer, 1992). But,

as described by Youngstrom (2014), these limits may be more appropriate for engineering and biomedical applications, as AUC is limited by the reliability and validity of the predictor measures. Youngstrom (2014) suggests that some of the best behavioral checklists available score within the ranges of .7–.8 under clinically realistic conditions. Thus, the current study used effect sizes to detect group differences according to criteria suggested by Rice and Harris (1995), such that .50–.59 signified low accuracy, .60–.65 signified moderate accuracy, and above .66 signified high accuracy[1]. Although these criteria are not as stringent as those that others have used (e.g., Pepe, 2003), they are justified at this stage of investigation to explore candidates of cognitive styles that are useful in distinguishing between these related mood disorders.

Preliminary Analysis

The demographic and clinical characteristics of the three diagnostic groups are presented in Table 3. Differences in demographics between the groups were analyzed using ANOVAs or Chi-Square tests. Diagnostic groups did not differ based on BAS risk group, gender, or race (white vs. non-white), but did significantly differ on age; thus, age was controlled in the MANCOVA (Table 1). In addition, the groups differed based on current depressive symptoms, $F(2,310) = .752$, $p = .001$, but not mania symptoms, $F(2,310) = 1.61$, $p = .20$. Therefore, depressive symptoms also were controlled for in the MANCOVA. As BAS risk group did not differ between groups, follow-up analysis examined whether mean levels of total BAS scores differed. A one-way ANOVA indicated significant mean level group differences on BAS $F(14,381) = 1.99$, $p = .02$. Therefore, BAS risk group was used as a control in the MANCOVA due to the study selection criteria as prior reports have shown a relationship between BAS status and some selected cognitive measures (Stange et al., 2013)[2]. As expected, many of the cognitive styles were significantly correlated (Table 1). Of note, cognitive styles considered to be more depressogenic (i.e. RPAS Dampening, both Rumination subscales, all three Depressive Experiences subscales, and all three self-consciousness subscales) were significantly correlated with depressive symptoms, and cognitive styles considered to be associated with mania/hypomania symptoms (i.e. all WASSUP, POG, and RPAS subscales) were significantly correlated with hypomanic symptoms.

Overall Group Differences

The overall MANCOVA (with BAS risk, age, and time 1 BDI as covariates) yielded significant group differences based on the dependent measures (Wilk's Lambda = .76, F =

[1]ROC analysis was chosen as it provides strong evidence of differential accuracy between cognitive styles based on history of disorder. This is important to distinguish as cognitive styles during a euthymic state may place individuals' at risk for subsequent episodes of depression or mania. This risk may be heightened for individuals who have had a prior mood episode as their cognitive styles may be more dysfunctional. An argument can be made to also measure overall mean differences between various cognitive styles that differ between groups. Whereas, this may help identify differences, these were not chosen to be included in the current study as this would both add to the number of analyses and be less parsimonious. One-way ANOVA analyses and post-hoc contrasts with each of the three diagnostic groups were used based on this argument. Results identified the same cognitive style differences and were largely similar to those presented in the ROC results. Thus, for clarity, the results that provide a more direct examination of distinguishing cognitive styles between groups (ROC) were presented.

[2]BAS risk status was used in the current analyses as a covariate to control for differences based on selection criteria. Actual BAS scores were also examined as a covariate in a separate test. Results did not significantly differ from the analysis using BAS risk status as a control and thus were not included in the current manuscript.

1.40, $p = .04$). As seen in Table 2, a number of specific cognitive styles showed significant group differences. This result allows an examination of post-hoc tests to determine the specific variables responsible for this omnibus effect. The measures that significantly differentiated between groups, controlling for the covariation of the other measures, include the WASSUP Family, WASSUP Well-being, POG Upward, SCS Private, SCS Public, RPAS Emotion Focused, RPAS Dampening, RRS Reflective Pondering, and the DEQ Self-Criticism subscale (Table 2). Analyses followed up to determine the applied utility of these scores with ROC. The following sections describe specific differences comparing the three groups.

Unipolar Depression Group versus Bipolar Group

The ROC analysis was used to determine which variables discriminated between groups based on the MANCOVA between the BD group and the MDD group. In ROC analysis (Table 4), the SCS Public and RPAS Emotion Focused subscales had strong ability to discriminate differences between the depressed and bipolar groups with scores that were equal to or exceeded .66, the recommended level for a strong effect size (Rice & Harris, 1995) and had significant *p* values. Additionally, the WASSUP Family subscale, RPAS Dampening, RRS Reflective Pondering and DEQ Self Criticism subscale showed moderate ability to discriminate between these groups, but did not have significant *p* values. AUC values can be interpreted as the percent that an individual will be correctly classified in their group based on the measure. On all measures, the BD group scored higher than the MDD group. For example, these results can be interpreted as indicating that an individual will be correctly classified in the bipolar group based on the RPAS Emotion Focused scale 66% of the time. In addition, individuals with bipolar disorder will be correctly classified based on the SCS Public subscale as opposed to being classified as an individual with major depression 69% of the time. Finally, some AUC values were below .5 indicating that some measures may be worse than chance in distinguishing between groups or the need to recode the values to be consistent with other cognitive styles.

Bipolar group versus Control group

The ROC analysis was used to determine which variables that showed significant group differences based on the MANCOVA could discriminate between the BD group and the control group. Using ROC analyses (Table 4), the SCS Public, RPAS Emotion Focused, and DEQ Self Criticism subscales had strong sensitivity to discriminate between the control and bipolar groups. AUC values for these measures all exceeded .66, the recommended level for a strong effect size (Rice & Harris, 1995) and all had significant *p* values. In addition, the SCS Private, RPAS Dampening, and RRS Reflective Pondering subscales had moderate sensitivity to discriminate between groups. Of these, only the RPAS Dampening and RRS Reflective Pondering subscales were significant. In all cases, the BD group scored higher than the control group. For example, these results indicate that 71% of the time, those with a bipolar diagnosis will be correctly classified based on the SCS Public scale compared to the control group. In addition, 70% of the time, individuals were correctly classified as in the bipolar group rather than the control group based on the RPAS Emotion Focused and DEQ Self-Criticism subscale. These three subscales most strongly detected the difference between individuals with a bipolar disorder versus controls with no mood disorder.

Unipolar depression group versus Control group

The ROC analysis was used to determine the sensitivity of the variables that showed significant group differences based on the MANCOVA between the MDD group and the control group. The AUCs in Table 4 provide information about the applied utility of each score. Analysis did not find a strong effect for any of the variables. The AUC value (.59) for POG Upward was the highest critical value in this set of analyses, which suggests a small effect size, indicating that 59% of the time, participants with a history of unipolar depression were correctly classified into the MDD group rather than the control group based on the POG Upward subscale. The third column under 'Control v MDD' in Table 4 provides significance levels: Although the WASSUP Family, POG Upward, and SCS Private scores were significant, results provide minimal confidence that the POG Upward is able to significantly discriminate between no mood disorder controls and those with a diagnosis of unipolar depression (Rice & Harris, 1995).

Discussion

The primary finding of the present study was that certain cognitive styles differentiated individuals with BD from individuals with MDD. Generally consistent with hypotheses, results indicated that compared with MDD participants, BD individuals demonstrated greater cognitive responses to positive affective states and displayed more social self-consciousness in public. In addition, BD participants may have more ambitious partner and family goals, were more likely to reflectively ponder about negative feelings, and were more self-critical compared to MDD individuals, but these latter findings were only trending. Among these factors, cognitive responses to positive affective states and social self-consciousness had the highest power to discriminate between the two diagnostic groups supporting the sensitivity and specificity of these measures in distinguishing between disorders.

Although there is evidence of similar cognitive styles in individuals with BD and MDD (e.g., Scott et al., 2000), emergent literature has supported cognitive differences between these two groups consistent with the present study's results (Alloy et al., 2009a; Alloy et al., 2009b; Carver & Johnson, 2009; Johnson & Jones, 2009; Stange et al., 2013; Van der Gucht et al., 2009). Consistent with previous work, results found that emotion-focused rumination on positive affect distinguished BD from MDD (Johnson et al., 2008). This is conceptually consistent with BD as differences between these groups would be expected based on reaction to positive affect, with individuals with BD more likely to exhibit elevated responses to positive affect (Feldman, et al., 2008; Gruber et al., 2011; Johnson & Jones, 2009; Kelly et al., 2011; Stange et al., 2013). The current study also replicated the finding that self-consciousness is an important discriminating cognitive style for BD. Whereas depressive or positive rumination involves a tendency to respond to affect, a more general tendency to focus attention on oneself appears to be associated with mood disorders. Consistent with prior research, the current study found that public and private self-consciousness differentiated between individuals with BD and individuals without mood disorder such that those with BD had higher levels of self-focus (Alloy et al., 2009a). Taken further, findings from the current study also suggest that specific self-focused styles

differentiate with high accuracy between individuals with BD and MDD. Individuals with BD had a higher tendency to focus on aspects of the self that are observable by others compared to individuals with MDD and may be more aware or sensitive to themselves in public.

Interestingly, contrary to expectations, three cognitive styles generally associated with depression differentiated the BD and MDD groups at a moderate level. Individuals with BD tended to dampen positive emotions, were more likely to reflectively ponder negative affect, and were more self-critical compared to the MDD group. In addition, these same three cognitive styles differentiated the BD group from the no mood disorder controls, generally at a higher accuracy than the MDD group. Consistent with prior work, BD individuals tend to have higher levels of depressive cognitive styles than healthy controls (e.g., Van der Gucht et al., 2009). Yet prior work also suggests that individuals with MDD have similar cognitive styles as those with BD when in remission (Alloy et al., 1999; Alloy et al., 2006; Hollon et al., 1986; Jones et al., 2005; Scott & Pope, 2003). It is important to note that all of the participants in the current BD sample had a history of at least one major depressive episode. Alloy et al. (1999) found that individuals with a history of hypomania and no depression had similar cognitive styles as healthy controls, whereas those with a depressive history had comparatively more negative cognitive styles than controls, but similar to those with major depression. Taken further, the present study's results suggest that individuals with BD may exhibit higher levels of certain depressogenic cognitive styles compared to those with MDD. Although speculative, this may suggest that individuals diagnosed with BD who have a history of depressive episodes may be more prone to further develop depressive episodes. In fact, in a large sample of individuals with mood disorders, Perlis et al. (2006) found that adults with BD generally have a history of a greater number of depressive episodes compared to those with unipolar depression, consistent with prior studies (Kessler et al., 2006; Winokur, Coryell, Endicott, & Akiskal, 1993). Therefore, it is possible that the discriminate ability of these cognitive measures in comparison to individuals with MDD may help to explain the higher incidence rates and levels of interference of depressive episodes in BD.

It may be helpful to interpret the differences found between the BD group and both the MDD and control groups through a behavioral approach system perspective. The BAS is considered to be a psychobiological system that regulates approach and appetitive motivation and behavior that is also characterized by certain cognitive styles (Alloy et al., 2009b). Cognitive styles relevant to the BAS may influence approach motivation and may include goal-striving, positive overgeneralization, ruminating on positive emotions, and being self-critical (Alloy et al., 2009b; Stange et al., 2013). The current study found support for these distinctions in that focusing thoughts on positive emotions (RPAS Emotion-Focused) and trending differences for dampening positive emotions (RPAS Dampening), and being self-critical distinguished between those with BD compared to those with MDD or controls with no mood disorder. Of note, the diagnostic groups did not significantly differ based on BAS risk status, although this sample was selected to consist of a group with high BAS and those with moderate BAS. In addition, the current study found trending support for one aspect of approach motivation and goal setting in that individuals with BD had higher levels of goals for partners and families compared to those with MDD. Although results

obtained support for cognitive measures that should theoretically differentiate those at-risk for BD based on the BAS theory, other measures that were expected to differ did not do so in the current study. Namely, the tendency to respond to success with excessive confidence and to generalize the causes of success to aspects of the self (positive overgeneralization) and most aspects of ambitious goal-setting did not differentiate the BD group from the other groups as found in prior studies (Eisner et al., 2008; Johnson et al., 2009). Further research should address the potential discriminate ability of certain aspects of BAS-relevant cognitive styles in the differentiation between those with MDD and BD.

Overall, results suggest that BD and MDD can be characterized by distinct cognitive styles that may have important implications for diagnostic and treatment procedures for each disorder. Given the finding that measures of positive rumination and social self-consciousness showed strong specificity, and dampening positive mood, reflectively pondering negative moods, and being self-critical moderately differentiated BD from both MDD and controls, it may be helpful for practitioners to not only take these factors into account during treatment, but to incorporate specific measures assessing these factors in the differential diagnosis process. Furthermore, findings emphasize the need to further investigate which specific aspects of these cognitive styles are most relevant to individuals with BD. For example, contrary to previous findings (Rosenfarb et al., 1998), individuals with BD in remission were more self-critical than those with MDD in remission. In addition, in contrast with prior research with MDD participants and controls (Bagby et al., 1994; Fenigstein et al., 1975; Franche & Dobson, 1992; Hartlage et al., 1998; Musson & Alloy, 1988; Nolen-Hoeksema, 1991; Rosenfarb et al., 1998; Ruiperez & Belloch, 2003), results did not yield significant differences between these two groups on cognitive style measures. Although it is difficult to determine the exact reason why the current study found different results for these measures, differences may be due to the sample selection criteria; recruiting only individuals with moderate and high BAS risk status may remove some of the variance seen in individuals with low BAS sensitivity. As such, the current study represents an important step in characterizing cognitive differences between mood disorders although further inquiry is needed.

Results should be interpreted within the context of methodological limitations. First, because the sample consisted of high school and college students, it is not clear to what degree these findings will generalize to the population at large. The current sample was chosen to be at higher risk to develop a bipolar disorder, and thus, caution is needed when generalizing these findings beyond the current sample characteristics. Analysis attempted to control for risk for bipolar disorder but some cognitive measures may be influenced by this risk, thus interpretation needs to be made with caution due to sample characteristics. As such, it will be crucial for future research to compare cognitive styles for each disorder across different cohorts to properly address the effects of age, risk and developmental factors. Second, a cross-sectional design was employed; thus, it cannot be determined whether the cognitive styles that distinguished BD and MDD participants would differentially predict risk for these two disorders prospectively or which measures predict those who transition from MDD to BD. Further, there is a possibility that because this was a selected at-risk community sample, some individuals in the control group will develop a mood disorder in the future. Although the current study cannot address these transitions, findings help to highlight cross-sectional

cognitive differences and can help with diagnostic clarity and an understanding of how individuals interact with their world. Additional limitations include the presence of comorbid diagnoses in some of the BD and MDD participants. It remains unclear to what extent comorbidity could have influenced the data; however, as analysis controlled for current mood state, the possibility of mood confounds may be minimized. Nevertheless, the absence of comorbid diagnostic data, particularly anxiety symptoms, may influence the presentation of negative cognitions and should be taken into account in future research. It is important to note that although the majority of the measures used in the current study displayed good to acceptable internal consistency, some measures displayed lower internal consistency; this may affect the stability of the current findings and should be taken into account when interpreting results.

Third, both a strength and limitation, participants in the current study were not currently in a current mood episode. The current study aimed at understanding cognitive style differences between groups that may help diagnostic clarity and treatment. This may take the form of understanding cognitive differences that place individuals at risk for the first onset but also at risk for subsequent recurrences of the disorder. Importantly, cognitive styles have been found to be both a risk factor and scarred by mood episodes (Joiner et al., 2003; McCarty et al., 2007), thus examining cognitive style differences between individuals with prior diagnoses may enhance researchers' and clinicians' understanding of differences between mood disorders. In addition, much prior research has not examined differences between mood disorders in euthymic states, which may enhance our understanding of what may trigger an episode prior to its occurrence. Nevertheless, symptom severity and episode severity may impact an individual's cognitive profile. Thus future research may benefit from examining differences in symptom/episode severity and cognitive styles that may help to delineate between diagnostic groups. Fourth, ROC analysis was used to assess the discriminate ability of cognitive style measures to distinguish between groups, a method that takes into account the sensitivity and specificity of each measure. Whereas, this approach has advantages for clinical utility, it is unable to continue to control for differences based on current symptoms. Even though the participants were not in a current mood episode, their current mood state may have influenced their responses. In addition, although the current study used less stringent criteria for evaluating the AUC values, these are justified at this stage of investigation. Finally, similar to prior research on these cognitive styles, results are primarily based on self-reported information, rendering the data subject to the self-awareness and honesty of participants.

Despite these limitations, results confirm and extend previous findings of cognitive styles specific to BD and MDD. Specifically, using ROC analyses, the current study has provided evidence regarding which cognitive styles are best able to differentiate between BD and MDD, rather than simply comparing means on these measures. Distinguishing between cognitive styles may be important for a clinician to understand in addition to assessing symptoms alone. This is especially important due to the episodic nature of depressive and hypo/manic symptoms, particularly if they occurred in the distant past. Research supports the stable nature of cognitive styles even in euthymic states (e.g., Hankin, Fraley, & Abela, 2005); thus clinicians may benefit from understanding interpretive biases that may occur in episode free periods. Given work showing that current pharmacological and psychosocial

interventions for MDD may not be as effective at treating BD (Miklowitz & Johnson, 2006; Scott et al., 2006), it has become increasingly important for investigators to make direct comparisons between these disorders in order to gain a better understanding of their similarities and differences. Ultimately, by clarifying the overlapping and diverging cognitive factors implicated in BD and MDD, research can not only improve diagnostic validity, but also provide more efficacious and effective treatments for each.

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Table 1

Correlations Between Study Variables

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1 WASSUP Pop	-	.20***	.36***	.48***	.26***	.60***	.50***	.29***	.52***	.38***	.18***	.10^	−.09	.19***	.29***	.18**	.14*	.17**	−.13*	.15*	.19**	.19**	.06
2 WASSUP Fam		-	.30***	.10^	.48***	.31***	.32***	.30***	.14*	.32***	.07	.11*	−.03	.36***	.35***	.13* 1	.21***	.05	.17**	−.13*	.28***	.12*	−.01
3 WASSUP Well			-	.38***	.23***	.36***	.40***	.14**	.25***	.17**	.07	.02	−.01	.26***	.31***	.20***	.19**	.17**	.01	.10^	.12^	.15**	.12*
4 WASSUP Poll				-	.12*	.41***	.28***	.23***	.36***	.27***	.07	.00	−.09	.11^	.21***	.14**	.08	.15**	−.19**	.14*	.15*	.18**	.03
5 WASSUP Friends					-	.32***	.23***	.36***	.31***	.36***	.05	.16**	−.07	.24***	.31***	.09^	.14*	.04	.27***	−.08	.08	.17**	−.02
6 WASSUP Finance						-	.32***	.25***	.41***	.45***	.08	.05	−.07	.21***	.30***	.16***	.13*	.09^	0.16**	.18**	.13*	.14*	.04
7 WASSUP Fullfil							-	.17**	.35***	.17**	.33***	.08	−.07	.24***	.21***	.16**	.23***	.32***	−.03	.13*	.18**	.14*	.19**
8 POG Lateral								-	.47***	.54***	.14**	.10^	−.11*	.35***	.48***	.01	.12^	.05	.06	.01	.34***	.24***	−.07
9 POG Up									-	.58***	.27***	.22***	−.12*	.22***	.34***	.22***	.12*	.09^	.00	.21***	.20**	.31***	.08
10 POGSocial										-	.14*	.20***	−.07	.23***	.32***	.16**	.10^	−.02	.01	.14*	.12*	.26***	.04
11 SCS Private											-	.46***	.14**	.33***	.20***	.24***	.31***	.40***	.14*	.36***	.27***	.09	.19**
12 SCS Public												-	.29***	.19***	.09	.26***	.44***	.14*	.39***	.49***	.18**	.02	.32***
13 SCS Social Anx													-	−.07	−.05	.26***	.26***	.06	.33***	.27***	−.20**	−.12*	.29***
14 RPAS Emotion Focused														-	.68***	.20***	.30***	.27***	.21*	.08	.41	.32***	.07
15 RPAS Self Focused															-	.16**	.26***	.15**	.15*	−.01	.37***	.31***	−.03
16 RPAS Dampening																-	.49***	.29***	.19**	.49***	.04	.09	.52***
17 RRS Brooding																	-	.45***	.33***	.53***	.20**	.01	.43***
18 RRS Reflective Pondering																		-	.01	.28***	.17**	.05	.24***
19 DEQ Dependency																			-	.10	.11^	−.01	.28***
20 DEQ Self Criticism																				-	.15*	.03	.59***
21 DEQ Efficacy																					-	.12	−.02
22 ASRM																						-	.00
23 BDI																							-
Mean	15.12	18.82	4.20	3.26	15.75	9.73	15.20	22.27	13.55	13.05	26.34	19.87	11.44	14.39	10.69	14.53	12.11	12.25	−0.66	−0.22	0.06	5.77	6.82
Standard Deviation	6.92	4.54	2.24	1.72	4.02	3.92	4.08	3.72	4.18	4.00	5.03	5.02	5.23	3.13	2.86	5.02	3.70	3.42	0.87	0.99	1.03	3.88	6.64

^ p< .10,

* p< .05,

** p< .01,

*** p< .001; Mean is of overall sample - to see mean breakdown by group see Table III

Note: The Willingly Approached Set of Statistically Unlikely Pursuits subscales: WASSUP Pop = total score on Popular Fame subscale; WASSUP Fam = total score on Partner & Family subscale; WASSUP Well = total score on World Well-Being subscale; WASSUP Friends = total score on Friends subscale; WASSUP Poll = total score on Political Influence subscale; WASSUP Finance = total score on Financial Success subscale; WASSUP Fulfill = total score on Creation/Fulfillment subscale; Positive Overgeneralization Scale Subscales: POG Lateral = total score on Lateral Generalization subscale; POG Up = total score on Upward Generalization subscale; POG Social = total score on Social Generalization subscale; Self-Consciousness Scale Subscales: SCS Private = total score on Private Self-Consciousness subscale; SCS Public = total score on Public Self-Consciousness subscale; SCS social Anx = total score on Social Anxiety subscale; ASRM = total score on the Altman Self-Rating Mania Scale; Positive Affect Scale Subscales: RPAS Emotion Focused = total score on Emotion-Focused rumination subscale; RPAS Self Focused = total score on Self-Focused rumination subscale; RPAS Dampening = total score on Dampening subscale; BDI = total score on the Beck Depression Inventory; Ruminative Response Scale subscales: RRS Brooding = total score on Brooding subscale; RRS Reflective Pondering = total score on Reflective Pondering subscale; Depressive Experiences Questionnaire subscales: DEQ Dependency = total score on Dependency subscale; DEQ Self Criticism = total score on self-criticism subscale; DEQ Efficacy = total score on Efficacy subscale.

Table 2

Group comparisons using MANCOVA

	Control (N = 228)	MDD (N = 122)	BD (N = 31)	MANCOVA
Measure	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	***F***
WASSUP Pop	14.92(6.81)	15.72(7.21)	14.47(6.48)	ns
WASSUP Fam	19.36(4.43)	17.55(4.86)	19.40(3.55)	4.21*
WASSUP Well	4.12(2.16)	4.11(2.24)	4.73(2.68)	3.18*
WASSUP Poll	3.13(1.62)	3.48(1.91)	3.27(1.76)	ns
WASSUP Friends	16.10(4.01)	14.93(4.04)	16.07(4.08)	ns
WASSUP Finance	9.78(3.80)	9.63(4.12)	9.87(4.17)	ns
WASSUP Fullfil	14.97(3.74)	15.36(4.50)	15.37(4.25)	ns
POG Lateral	22.61(3.55)	21.52(3.94)	22.90(3.60)	ns
POG Up	13.36(4.12)	13.99(4.34)	13.28(4.12)	2.93*
POG Social	13.23(3.94)	12.84(4.25)	12.90(3.96)	ns
SCS Private	25.67(5.33)	26.91(4.45)	28.30(4.63)	3.61*
SCS Public	19.46(5.12)	19.87(4.99)	22.30(4.07)	3.50*
SCS Social Anx	11.43(5.23)	11.20(5.01)	12.23(6.01)	ns
RPAS Emotion Focused	14.11(3.29)	14.44(3.09)	16.13(1.61)	3.90*
RPAS Self Focused	10.70(2.89)	10.49(3.01)	11.39(2.60)	ns
RPAS Dampening	13.89(4.53)	15.13(5.59)	15.84(5.20)	4.42*
RRS Brooding	11.74(3.76)	12.31(3.64)	13.10(3.13)	ns
RRS Reflective Pondering	11.81(3.40)	12.66(3.26)	13.50(3.70)	3.02*
DEQ Dependency	−0.71(0.88)	−0.58(0.84)	−0.55(0.94)	ns
DEQ Self Criticism	−0.35(1.01)	−0.13(0.93)	0.18(0.88)	4.41*
DEQ Efficacy	0.01(1.03)	−0.03(1.05)	0.58(0.91)	ns

Note:

* $p < .05$; Acronyms are the same as in Table 1.

Table 3

Sample Demographic and Clinical Characteristics

	Control (N = 228)	MDD (N = 122)	BD (N = 31)	ANOVA Diff
Characteristic	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**F**
Continuous				
Age	18.24 (1.43)	18.41 (1.41)	18.64 (1.48)	3.74*
Range	15–21	15–22	16–21	
	N (%)	N (%)	N (%)	Chi-Square
Categorical				
Female	160(70)	79(65)	22(71)	1.12
White	123(54)	76(62)	15(48)	3.08
BAS High Risk	126(56)	65(54)	23(74)	4.22

^ p< .10,

* p< .05,

** p< .01,

*** p< .001;

BAS = Behavioral Approach System

Table 4

Specificity of diagnostic group by measure informed from ROC contrasts

	Control v MDD			Control v BD			MDD v BD		
Test Result Variable(s)	**AUC**	**SE**	***p***	**AUC**	**SE**	***p***	**AUC**	**SE**	***p***
WASSUP Fam	0.40	0.04	0.01	0.53	0.06	0.69	0.64	0.06	0.06
WASSUP Well	0.49	0.04	0.80	0.57	0.08	0.29	0.59	0.08	0.25
POG Upward	0.59	0.04	0.03	0.52	0.07	0.76	0.43	0.07	0.35
SCS Private	0.58	0.04	0.05	0.63	0.06	0.07	0.56	0.07	0.45
SCS Public	0.52	0.04	0.66	0.71	0.06	0.00	0.69	0.06	0.01
RPAS Emotion Focused	0.53	0.04	0.52	0.70	0.04	0.00	0.66	0.05	0.03
RPAS Dampening	0.52	0.04	0.61	0.65	0.07	0.04	0.63	0.07	0.09
RRS Reflective Pondering	0.56	0.04	0.14	0.64	0.07	0.04	0.60	0.08	0.17
DEQ Self Criticism	0.56	0.04	0.11	0.70	0.05	0.00	0.63	0.07	0.07

Acronyms are the same as in Table 1.