Positive and Negative Activation in the Mood Disorder Questionnaire: Associations with psychopathology and emotion dysregulation in a clinical sample

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Abstract

The Mood Disorder Questionnaire (MDQ; Hirschfeld et al., 2000) is a screening measure for bipolar disorder (BD), previously found to comprise separate Positive and Negative Activation subscales. We sought to replicate these factors and examine their associations with a range of psychopathology. To further explicate the nature of Negative Activation, we examined associations with the Difficulties in Emotion Regulation Scale (DERS), a measure of emotion dysregulation. The sample consisted of 1,787 participants from an outpatient treatment facility. Confirmatory Factor Analysis replicated the existence of Positive and Negative Activation subscales. Logistic regressions, as hypothesized, found that Positive Activation was positively associated only with BD, while Negative Activation was associated with almost all disorders. The Impulse and Goals subscales of the DERS were uniquely associated with Negative Activation, suggesting it may specifically assess impulsive behavior in emotional situations. The findings suggest that it may be important to attend to both MDQ subscales.

Keywords: Bipolar disorder; confirmatory factor analysis; mood disorder questionnaire; psychopathology; emotion dysregulation

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Bipolar spectrum disorders (BD) are associated robustly with significant psychosocial impairment (e.g., poor work and relationship functioning), economic costs due to high utilization of healthcare services, and mortality due to suicide (Ferrari et al., 2016; Schaffer et al., 2015). Importantly, research indicates that effective treatment of BD differs significantly from that of other related disorders, such as unipolar depression. For example, the use of antidepressants in BD treatment is controversial (Sidor & MacQueen, 2011). In psychotherapy, treatment more often involves addressing issues such as unrealistic goal-setting and impulsivity in patients with BD than in others (Geddes & Miklowitz, 2013; Miklowitz & Johnson, 2006). Failing to detect cases of BD can, thus, lead to suboptimal treatment approaches and, thereby, exacerbate personal and societal costs associated with BD (Conus, Macneil, & McGorry, 2014; Matza, Rajagopalan, Thompson, & de Lissovoy, 2005). The reverse issue, where individuals are identified as having BD when they do not, may similarly lead to suboptimal treatment (Mitchell, 2012). There is therefore a need to be able to correctly identify and distinguish BD, both generally and in clinical populations. However, BD may often go undetected in clinical practice, as patients with histories of hypomania/mania commonly present for treatment outside of these episodes, when they are experiencing other, potentially more aversive, symptoms such as sadness and worry (Hirschfeld et al., 2000; 2003).

Consequently, researchers have shown considerable interest in developing measures to identify cases of BD and to discriminate it from unipolar depression (Carta & Angst, 2016; Miller, Johnson, & Eisner, 2009; Youngstrom, Murray, Johnson, & Findling, 2013). For example, measures such as the Hypomanic Personality Scale (HPS; Eckblad & Chapman, 1986)

have been widely used to assess personality traits (e.g., proneness to grandiosity and affective lability) linked longitudinally to BD (Walsh, DeGeorge, Barrantes-Vidal, & Kwapil, 2015). Other measures, such as the Hypomania Checklist (Angst et al., 2005) and the Mood Disorder Questionnaire (MDQ; Hirschfeld et al., 2000) have been developed to screen for a history of hypomania/mania symptoms. These screening measures to detect hypomania/mania history have been widely used in efforts to detect a history of BD in patients to optimally guide treatment (Carta & Angst, 2016). In particular, a large literature has examined the psychometric properties and utility of the MDQ for these purposes, which has been cited nearly 1,350 times as of February 2019 according to Google Scholar.

Traditionally, a positive screen on the MDQ requires endorsement of (a) 7 or more of 13 symptom items, (b) multiple symptoms occurring at the same time, and (c) symptoms causing notable psychosocial impairment (Hirschfeld et al., 2000; Hirschfeld et al., 2003). However, research using the MDQ has relied heavily on the use of total scores (i.e., the sum of scores across all 13 MDQ symptom items). Both indices, screen and total score, rest upon the assumption that the latent structure of the MDQ is unidimensional and that all 13 items capture roughly equivalent aspects of the same underlying latent variable. This assumption of unidimensionality is especially important to consider given that it is possible for individuals who endorse almost completely different sets of items to appear the same in terms of screening or total score. For example, two individuals with a positive screen need only overlap on one item.

However, results from a number of studies suggest that the MDQ is not unidimensional (see Ruggero et al., 2014; Stanton & Watson, 2017 for review). For example, Benazzi and Akiskal (2003) found that MDQ items defined distinct Energized-Activity (e.g., increased energy and decreased need for sleep) and Irritability-Racing Thoughts (e.g., irritable mood, racing

thoughts) factors in a sample of outpatients with histories of unipolar depression and bipolar II disorder (N = 181). In another, similar, study using a sample of 59 patients with bipolar I disorder and 63 patients with unipolar depression, Bech et al. (2011) found that MDQ items define "Active/Elevated" and "Risk-Taking/Irritable" dimensions. Other studies examining the MDQ's item level structure across community and clinical samples have also found evidence for distinct dimensions defining the MDQ (e.g., Chung, Tso, and Chung, 2009; Chung, Tso, Cheung, & Wong, 2008; Jon et al., 2009; Kiejna et al., 2010). However, the nature and number of these specific structures varied across studies (e.g., Jon et al. 2009 focused on three factors; whereas Kiejna et al., 2010 found evidence for a two-factor solution). Regardless of differences, they collectively highlight the heterogeneous nature of the MDQ's item content. While these studies advanced our knowledge about the nature of the MDQ, they also have significant limitations. First, sample sizes in many prior analyses were relatively small for factor analytic investigations (i.e., < 200 participants; e.g., Bech et al., 2011; Benazzi & Akiskal, 2003; see Clark & Watson, 1995 for discussion of these issues). Small sample sizes, in addition to sample types varying across studies (e.g., examining the MDQ's factor structure in general community members versus individuals diagnosed with BD), may have contributed to cross-study differences in factor structures. Second, many studies used principal components rather than factor analysis (e.g., Chung et al., 2009; Kiejna et al., 2010). Third, and related, many did not present full sets of factor loadings from their structural analyses (e.g., Benazzi & Akiskal, 2003; Chung et al., 2009; Jon et al., 2009), further complicating comparisons across studies.

To address these issues, Stanton and Watson (2017) investigated the structure of the MDQ's 13 symptom items in a large sample of 700 adults reporting current psychiatric treatment. Patients were not restricted by diagnostic category. This, in many ways, mimics how

BD screening would be conducted in practice (i.e., to determine if patients presenting for a broad range of issues have a history and/or risk for hypomania/mania). They found that the MDQ was best represented by two factors, which they termed Positive Activation (e.g., "had much more energy"; "was much more confident") and Negative Activation (e.g., "thoughts raced"; "felt very irritable") symptom dimensions.

This multidimensionality of the MDQ is, perhaps, not surprising, as it was modeled after *DSM*-based descriptions of hypomanic/manic symptom criteria (Hirschfeld et al., 2000; 2003). For example, *DSM* descriptions of hypomania/mania are defined by symptoms indicative of both positive (e.g., euphoric mood, increased energy) and negative affective (e.g., irritability) dysfunction. However, this multidimensionality is potentially problematic. If not accounted for, it can conflate participants with very different symptom profiles. Moreover, Stanton and Watson (2017) found that the two factors were differentially related to constructs of interest. While both were associated with self-report scales of mania, Negative Activation was additionally associated with a number of other maladaptive personality traits (higher neuroticism, lower conscientiousness) and indicators of psychopathology (antagonism, disinhibition, and substance use). Negative Activation was also associated with the degree to which participants rated their symptoms on the MDQ as impairing/severe, whereas Positive Activation was not. Negative Activation, then, may tap a broader emotion dysregulation construct (Carpenter & Trull, 2013; Gratz & Roemer, 2004; Hofmann, Sawyer, Fang, & Asnaani, 2012; Kring & Sloan, 2009), or transdiagnostic personality traits such as neuroticism and disinhibition (Kotov et al., 2010; 2017). However, while Stanton and Watson (2017) found evidence that Negative Activation is associated with neuroticism and disinhibition, among other traits, no work has examined the association of Negative Activation and trait emotion dysregulation.

If Negative Activation serves as an indicator of a broader, transdiagnostic construct (e.g., emotion dysregulation, neuroticism, disinhibition), this may, in part, explain why it captures not only individuals who are experiencing mania/hypomania, but also a range of other psychopathology. Positive Activation, in contrast, may be specifically associated with mania/hypomania. This is supported by prior research indicating that symptoms such as grandiosity and increased energy (both items included in Positive Activation) may be relatively specific to BD (Stanton, Gruber, & Watson, 2017; Watson & Naragon-Gainey, 2014).

Aims of the Current Study

While evidence supports the multidimensionality of the MDQ items, there are several key limitations to previous work. Perhaps most importantly, Stanton and Watson (2017) was based entirely on self-report measures and examined associations for Positive and Negative Activation within a limited range of psychopathology. Past research has found that MDQ total scores are associated with anxiety, trauma-related, substance use, eating, and impulse control disorders, in addition to BD (Paterniti & Bisserbe, 2018; Zimmerman et al., 2011). Interpreted in the context of Stanton and Watson's (2017) findings, it may be that these non-BD associations were largely specific to Negative Activation. There is, therefore, a need to examine the associations of the two factors with a range of clinically diagnosed psychiatric disorders.

Second, although the associations between Negative Activation and measures of psychopathology suggest that Negative Activation may be associated with emotion dysregulation more broadly, Stanton and Watson (2017) did not include a measure of emotion dysregulation in their study. Emotion dysregulation is a broad construct that can be decomposed into multiple factors (Carpenter & Trull, 2013; Gratz & Roemer, 2004; Hofmann, Sawyer, Fang, & Asnaani, 2012; Kring & Sloan, 2009), and it is unknown whether Negative Activation is related to specific

aspects of emotion dysregulation. From a transdiagnostic perspective, knowing how Negative Activation is related to emotion dysregulation would shed light on the specific risks experienced by individuals who score high on this factor, regardless of whether they meet for BD. For this reason, the present study examined the association of Negative and Positive Activation with the Difficulties in Emotion Regulation Scale (DERS), which assesses multiple different components of emotion dysregulation.

It is also highly important to evaluate the extent to which the structural findings presented by Stanton and Watson (2017) replicate in an independent and clinically diagnosed sample. Given current and ongoing controversies about the replicability of psychology, there is a need for more replication work in clinical psychology as a whole (Tackett et al., 2017). Therefore, to replicate and extend Stanton and Watson (2017), we examined the structure of the MDQ in a large sample of outpatients (N = 1,787) who completed the MDQ and a wide range of structured diagnostic interviews as part of their intake process at a community-based outpatient practice affiliated with an academic medical center. Such a sample is optimal for examining the MDQ's psychometric properties and relations, given that BD screening may be most necessary in samples wherein it is necessary to "detect" BD cases amongst individuals presenting for treatment for a diverse range of issues.

Specifically, we used a confirmatory factor analytic (CFA) approach to identify the degree to which the two-factor Positive and Negative Activation structure identified by Stanton and Watson (2017) also optimally reflected the structure of the MDQ items in this sample. We hypothesized that the two-factor structure would replicate in our sample. We then examined associations for the resulting CFA factors with diagnostic ratings for a range of psychopathology. Given replication of the MDQ structure, we predicted that Positive Activation would be

associated with BD diagnosis and no other forms of psychopathology, while Negative Activation would be strongly and nonspecifically associated with a range of diagnoses, including BD but also all other disorders. These predictions were made based on previous research suggesting that symptoms captured by the hypothesized Positive Activation factor are specific to BD (Kotov et al., 2010; 2017), while symptoms captured by the Negative Activation factor are more broadly related to emotion dysregulation and transdiagnostic personality traits (Carpenter & Trull, 2013; Hofmann et al. 2012; Kring & Sloan, 2009; Stanton, Gruber, & Watson, 2017; Watson & Naragon-Gainey, 2014).

Finally, we conducted exploratory analyses examining the association of Negative and Positive Activation and components of emotion dysregulation, as assessed by the Difficulties in Emotion Regulation Scale (DERS). We hypothesized that Negative Activation would be associated with subscales of the DERS, while Positive Activation would not, the latter providing support for the specificity of associations to Negative Activation. We did not have hypotheses regarding the associations for the different DERS subscales with Negative Activation. Therefore, we considered these analyses exploratory.

Method

Participants

Participants (N = 1,787) were outpatients who completed the MDQ and a range of other clinician-rated measures as part of their intake process for receiving treatment at a community-based outpatient psychiatry practice affiliated with an academic medical center. Note that this outpatient psychiatry practice treats patients with a range of presenting issues such that services are not restricted based on presenting issue or diagnosis. Mean age in the sample was 39.8 years (SD = 13.9), and most participants identified as female (58.5%). The vast majority of participants

identified as White (88.1%), with remaining participants identifying as a range of other races or ethnicities (4.0% Black/African-American, 2.8% Portuguese, 2.6% Hispanic or Latino, 1.2% Asian-American/Asian, 1.4% Other). This research received institutional review board approval, and informed consent was obtained from all individual participants included in this research.

Measures

Mood Disorder Questionnaire. The MDQ (Hirschfeld et al., 2000) is a 13-item measure designed to screen for the lifetime occurrence of hypomania/mania. Item content selection of the MDQ was guided by criteria defining hypomanic/manic episodes in the *DSM-IV* (American Psychiatric Association, 1994) as well as the clinical experiences of the measure's authors. Participants responded to the 13 MDQ symptom items using a dichotomous "Yes" or "No" response format. Stanton and Watson (2017) found that 3 of the MDQ symptoms (items 5, 10, and 11) loaded highly onto both Positive and Negative Activation factors and, therefore, removed them from their final model. As the present study was a replication of Stanton & Watson (2017) in a clinical sample, we performed the CFA using these same 10 items. The Kuder-Richardson Formula 20 (K-R 20) reliability for the 10 MDQ symptom items was .82. Descriptive statistics and correlations between the 10 items included in the CFA are presented in Table 1. Participants who positively endorse experiencing multiple past symptoms on the MDQ, are asked to indicate (a) if "several" of the endorsed symptoms were experienced concurrently (i.e., yes/no) and (b) the degree to which these symptoms caused functional impairment (i.e., from *no problems* to *serious problems* in regard to domains such as work, finances, relationships, and legal issues).

Difficulties with Emotion Regulation Scale. The DERS (Gratz & Roemer, 2004) is a commonly used 36-item measure designed to assess participants' ability to manage their

emotions. The DERS is multidimensional in nature and is made up of six subscales. These subscales consist of having negative responses to negative emotions (Nonacceptance, α = .90), difficulties in engaging in goal-directed activity when under stress (Goals, α = .87), difficulties in maintaining control of behavior under stress (Impulse, α = .90), reduced ability to engage in emotion regulation strategies (Strategies, α = .90), inability to attend to emotions (Awareness, α = .81), and inability to recognize what emotions are being experienced (Clarity, α = .80). The DERS was added later in patient recruitment than the MDQ and, thus, there were fewer participants who completed the DERS (*n* = 948).

Diagnostic Interview Measures of Psychopathology. Personality pathology was assessed via the Structured Interview for *DSM-IV* Personality (*SIDP-IV*; Pfohl, Blum, & Zimmerman, 1997). Note that, although the SIDP-IV was designed to assess personality pathology as described in the *DSM-IV,* the *DSM-5* Section II personality disorder (PD) diagnoses are equivalent to those from *DSM-IV*. Other erstwhile "Axis I" diagnoses were assessed using the Structured Clinical Interview for *DSM-IV* Axis I Disorders (SCID; First, Spitzer, Gibbon, & Williams, 1995). Note that a wide range of diagnoses were assessed and scored using the SCID, such that examining the MDQ's relations with all of these diagnostic ratings would have been cumbersome. Thus, we examined relationships for "common" internalizing (e.g., depressive disorders, generalized anxiety disorder) and externalizing diagnoses (e.g., alcohol and illicit substance use disorders), as well as diagnoses that were central to our study aims (e.g., bipolar spectrum disorder diagnoses). Additionally, in several cases we condensed multiple related disorders into a single category (e.g., anorexia nervosa, bulimia nervosa, and binge eating disorder were combined into a "any eating disorder" category). This was done in order to

simplify the analyses and, in several cases, to increase power where disorders were not frequently endorsed. Prevalence rates for all diagnoses examined are listed in Table 2.

The SIDP-IV, SCID, and psychosocial assessment indicators were administered and scored by interviewers who were Ph.D.-level psychologists or research assistants with bachelor's level degrees. Research assistants were required to complete several months of training, consisting of observing 20 or more diagnostic interviews as well as subsequently being supervised while administering over 20 interviews. Interrater reliability for diagnoses and ratings included in the current study are reviewed in several other publications from this sample (e.g., Stanton & Zimmerman, 2017; Zimmerman, 2016). These reliability analyses indicate that kappas for all diagnoses fall within the good to excellent range (see Cicchetti, 1994 for interpretation guidelines). Specifically, kappas for borderline PD and all internalizing diagnoses exceed .80, kappa for BD diagnoses were .75, and kappa for both substance (non-alcohol) and alcohol use disorders were .64 (Gorlin, Dalrymple, Chelminski, & Zimmerman, 2016; Zimmerman, 2016).

There were 42 individuals with incomplete diagnostic data (e.g., missing some diagnoses but not others). These participants were included in the analyses, except where each participant's missing data prevented this. Excluding these participants from all analyses via listwise deletion did not change the results.

Analytic Plan

We present two series of analyses addressing our study aims. First, we conducted a CFA using the mean- and variance-adjusted weighted least squares estimator (WLSMV) in Mplus 8 (Muthén & Muthén, 2017). The WLSMV estimator is used to accommodate dichotomous data, as was the case for MDQ items. Guidelines for what constitutes a good fit vary; however, a comparative fit index (CFI) $\geq .96$, and a weighted root-mean-square residual (WRMR) of

approximately 1.0 are thought to indicate good fit with categorical data (Yu, 2002). Chi-square values that are closer to zero and not significant are suggestive of good fit (Kline, 2011). Root mean square error of approximation (RMSEA) values < .06 are thought to indicate a close fit (Hu & Bentler, 1999). Chi-square difference testing was employed to determine differences in relative fit between nested models in the CFA analyses using the DIFFTEST function in Mplus 8 (Muthén & Muthén, 2017). This is operationalized as the relative fit of the base model and the expanded alternative model.

Second, we conducted a series of 18 logistic regression models with the Positive and Negative Activation factor scores predicting each diagnosis category. Age and gender were included as covariates in order to adjust for the fact that the prevalence of many disorders vary based on these factors. Not including these covariates in models did not affect the results. Third, we examined whether Positive and Negative Activation were associated with whether MDQ symptoms were concurrent and caused impairment/distress. As impairment was assessed continuously we utilized linear regression to test this. We again adjusted for age and gender.

Finally, we conducted a linear regression model to examine the association of the six DERS subscales with Positive and Negative Activation. We were specifically interested in which DERS subscales were uniquely associated with Negative Activation. Therefore, for these analyses, Negative Activation was the outcome and the six DERS subscales were entered simultaneously as predictors. In addition to age and gender, we included Positive Activation as an additional covariate. This was done because Positive and Negative Activation were expected to be correlated and we were specifically interested in examining the variance unique to Negative Activation. Positive and Negative Activation were expected to be correlated based upon prior research using the MDQ and other measures indicating that hypomania/mania symptoms are

heterogeneous in nature, but overlapping (see Ruggero et al., 2014; Stanton & Watson, 2017 for further discussion regarding the interrelations of specific symptom types). To examine whether associations with Negative Activation were specific to this factor, or to the MDQ as a whole, we conducted an additional linear regression with Positive Activation as the outcome, the six DERS subscales as predictors, and Negative Activation as a covariate.

Results

Confirmatory Factor Analysis

To test our hypothesis that the MDQ is best characterized by a two-factor structure, we first estimated a one-factor CFA model where the 10 MDQ items that comprise the two-factor solution identified by Stanton and Watson (2017) loaded onto a single factor. This model was a reasonable fit to the data χ^2 (35, N = 1,787) = 611.11, $p < .001$; CFI = 0.95; RMSEA = 0.096, 90% CI [.089, .103]; WRMR = 2.81, and the 10 items all adequately loaded strongly onto the single factor (all loadings ≥ .50). Next, we estimated a two-factor model following the factor solution obtained by Stanton and Watson (2017). Here the 2 factors represent Positive Activation (4-items) and Negative Activation (6-items), respectively. This model was a very good fit to the data χ^2 (34, N = 1,787) = 243.95, $p < .001$; CFI = 0.983; RMSEA = 0.059, 90% CI [.052, .066]; WRMR = 1.72. Consistent with our hypothesis, the 2-factor model was a significantly better fit to the data than the 1-factor model, $\Delta\chi^2$ (1, N = 1,787) = 161.49, $p < .001$. Examination of the two-factor model revealed that individual items loaded well onto their respective factors, as shown in Table 3, with standardized loadings ranging from .69 to .96 for Positive Activation and from .60 to .90 for Negative Activation. The two factors also were moderately correlated with one another (r = 0.45, $p < .001$). In terms of MDQ items, participants endorsed an average of

1.40 Positive Activation (*SD* = 1.50; out of 4) and 2.69 Negative Activation items (*SD* = 1.79; out of 6).

Positive Activation and Negative Activation Subscale Score Associations

To test the hypotheses that Positive Activation would be uniquely associated with BD diagnosis and Negative Activation would be associated with a range of diagnoses, a series of 18 logistic regressions were conducted where each psychiatric diagnosis category was regressed on Positive and Negative Activation factor scores while adjusting for age and gender (see Table 2). Results show that Positive Activation and Negative Activation exhibited distinct patterns of associations with psychopathology. Consistent with prediction, Positive Activation was positively associated only with BD diagnosis. It was additionally associated negatively with depressive disorders, post-traumatic stress disorder, alcohol use disorder, and cocaine use disorder, such that a higher Positive Activation score was associated with lower odds of endorsing these disorders. Negative Activation, on the other hand, was positively associated with the majority of diagnoses, specifically BD, depressive disorders, panic disorder, generalized anxiety disorder (GAD), post-traumatic stress disorder (PTSD), all personality disorders, alcohol, marijuana, cocaine, and polydrug use disorders, and eating disorders. In all, Negative Activation displayed significant positive associations with 14 of the 18 included diagnostic categories.

We next examined associations with ratings of whether MDQ symptoms had been experienced concurrently in time, and ratings of impairment/distress due to MDQ symptoms, both of which are required to yield a "positive" MDQ screen. Positive Activation was not significantly related to experiencing symptoms concurrently (OR = 1.40; 95% confidence interval (CI) = (0.95, 1.97), $p = .054$), while Negative Activation was (OR = 70.11; CI = (38.46, 127.83), $p < .001$). Linear regression revealed that Positive Activation was negatively associated

with ratings of impairment/distress (b = -0.54, CI = (-0.65, -0.43), $p < .001$, β = -0.34). In contrast, Negative Activation was positively associated with impairment/distress (b = 2.16, CI = (1.99, 2.33), $p < .001$, β = 0.94). We additionally examined associations with impairment/distress specifically in individuals with BD.[1] Positive Activation was no longer associated with distress, although a negative trend remained (b = -0.38, CI = (-0.82, 0.07), $p = .095$, β = -0.20). Negative Activation remained positively associated in participants with a bipolar diagnosis (b = 1.78, CI = (1.14, 2.42), $p < .001$, β = 0.32).

Finally, we examined the association of the DERS subscales with Positive and Negative Activation. Correlations indicated that Positive Activation was positively associated with all DERS subscales (Nonacceptance = $r(946) = .197$, $p < .001$; Goals = $r(946) = .266$, $p < .001$; Impulse = $r(946) = .341$, $p < .001$; Strategies = $r(946) = .274$, $p < .001$; Clarity = $r(946) = .219$, $p < .001$), except Awareness ($r(946) = .052$, $p = .110$). Negative Activation was positively associated with all DERS subscales (Nonacceptance = $r(946) = .260$, $p < .001$; Goals = $r(946) = .370$, $p < .001$; Impulse = $r(946) = .444$, $p < .001$; Strategies = $r(946) = .375$, $p < .001$; Clarity = $r(946) = .93$, $p < .001$; Awareness = $r(946) = .103$, $p = .002$).

To examine our primary aim of determining unique associations between Negative Activation and the DERS subscales, we entered all DERS subscales into a regression model, with Negative Activation as the outcome. There were significant associations for Goals (b = 0.01, CI = (0.004, 0.01), $p < .001$, β = 0.08) and Impulse (b = 0.01, CI = (0.004, 0.01), $p < .001$, β = 0.09). Thus, participants higher on Negative Activation also scored higher on these two DERS subscales. The remaining subscales were not associated (see Table 4). In contrast, a regression with Positive Activation as the outcome found significant *negative* associations with

[1] It was not possible to conduct an equivalent analysis for the concurrent symptoms item, as all but 9 participants with BD answered this item affirmatively.

Goals (*b* = -0.01, CI = (-0.01, -0.001), *p* = .026, β = -0.05) and Awareness (*b* = -0.01, CI = (-0.01, -0.00001), *p* = .049, β = -0.04).

Discussion

The present study examined the factor structure of the MDQ and the patterns of associations of the resulting MDQ factors with a broad range of psychopathology in a clinical sample. The CFA replicated previous work (Stanton & Watson, 2017), indicating that the MDQ is composed of two factors, Positive and Negative Activation. Results also extended previous work, finding that Positive Activation was positively associated solely with BD, highlighting the specificity of positive activation content (e.g., increased energy and activity) in predicting this disorder. Positive Activation was also negatively associated with depressive disorders, PTSD, and alcohol and cocaine use disorders. Depression and PTSD both include criteria (e.g., anhedonia, negative affect, difficulty sleeping) that are the inverse of Positive Activation items and this may, in part, explain these negative associations. The negative associations for alcohol and cocaine use disorders are less clear. Both substances are frequently used for their stimulative effects. While speculative, it may be that individuals who use these substances problematically are predisposed to having low levels of Positive Activation and, therefore, are seeking stimulation. Alternatively, these substances may lead to reduced Positive Activation as use disorder develops (e.g., via reductions in reward sensitivity; Koob & Le Moal, 2008). However, it is not clear why alcohol and cocaine would have these effects and not other substances.

In contrast, Negative Activation was associated with BD as well as a number of other disorders, many of them (e.g. depressive disorders, PDs, PTSD, GAD, substance use disorders) characterized by emotion dysregulation and/or transdiagnostic personality traits such as neuroticism and disinhibition (Carpenter & Trull, 2013; Hofmann et al. 2012; Kring & Sloan,

2009; Stanton, Gruber, & Watson, 2017; Watson & Naragon-Gainey, 2014). In this way, the findings contextualize those of previous studies that have found that MDQ total scores were associated with a wide range of different forms of psychopathology, especially those associated with emotion dysregulation and disinhibition (Paterniti & Bisserbe, 2018; Zimmerman et al. 2011). The current study, which utilized the same sample as Zimmerman et al. (2011), plus additional participants recruited following their publication, demonstrates that these associations are specific to the Negative Activation factor. Notably, our results for Negative Activation are consistent with studies using other measures (e.g., Expanded Version of the Inventory for Depression and Anxiety Symptoms; IDAS-II; Watson et al., 2012) indicating that negatively valenced symptoms (e.g., irritability, racing thoughts) are not specific to hypomania/mania. Instead, they appear to overlap strongly with other forms of psychopathology such as depression and anxiety (e.g., Ruggero et al., 2014; Stanton et al., 2019).

Of note, while Negative Activation was associated with a number of different disorders, the size of the ORs were largest for borderline personality disorder (BPD) and BD. It is important to note that CIs, in general, overlapped considerably, making the interpretation of differences in magnitude more difficult. However, it may be meaningful that these two disorders were most strongly associated with Negative Activation. First, it highlights that Negative Activation, while generally associated with psychopathology, is a core component of BD. Second, BPD is characterized by impulsivity in emotional situations (e.g., Whiteside, Lynam, Miller & Reynolds, 2005) and, therefore, it is not surprising that it would be closely associated with Negative Activation. Third, BPD is often diagnosed as BD, and vice versa (e.g., Paris & Black, 2015; Ruggero, Zimmerman, Chelminski, & Young, 2010). The difficulty in differentiating between the two disorders, which may also co-exist, may, in part, be due to the

fact that both disorders are so highly associated with Negative Activation. Supporting this, recent work has found that two Positive Activation items (feeling good/hyper and increased goal-related activity), as well as whether symptoms were experienced concurrently, better distinguished between BD and BPD than the full MDQ including Negative Activation items (Balling, Chelminski, Dalrymple, & Zimmerman, 2019; Vöhringer et al., 2016).

The current study both replicates Stanton and Watson (2017) in a unique, and significantly larger, clinical sample, and addresses several limitations of the previous work. Stanton and Watson (2017) recruited their sample online through Amazon Mechanical Turk. Given that information about the nature of the sample was necessarily limited, the nature and degree of severity of psychopathology in their sample is largely unknown. In the present work, participants had been admitted to an outpatient treatment facility and, thus, all had some form of psychopathology. Additionally, the fact that participants completed diagnostic interviews enabled us to examine the factor structure of the MDQ in individuals with a range of diagnoses, including BD, which Stanton and Watson (2017) were not able to do.

The current study also builds upon past work by elaborating upon the nature of the Negative Activation factor. Examining correlations, both Positive and Negative Activation were generally associated with emotion dysregulation, as assessed by the DERS. However, when entered into a regression model, the Goals and Impulse subscales of the DERS were uniquely associated with Negative Activation. In contrast, Positive Activation was negatively associated with Goals and Awareness subscales. It is not clear why this was the case, but Positive Activation includes items related to being more active, as well as generally more hedonically pleasant symptoms. It may be, then, that individuals high on Positive Activation perceive themselves as goal-directed and in-tune with their feelings. However, we primarily examined the

relationship of the DERS and Positive Activation in order to determine whether associations with Negative Activation were specific to this factor, or to the MDQ as a whole. Results indicate that associations were specific to Negative Activation.

Regarding the unique associations for Negative Activation, the Goals and Impulse subscales are conceptualized to be highly similar, with Goals representing the ability to engage in appropriate goal-directed behavior, and Impulse representing the ability to refrain from inappropriate behavior when experiencing negative emotions (Gratz & Roemer, 2004). While we did not have hypotheses regarding this exploratory analysis, the results are congruent with the nature of BD. Difficulties with concentration/distractibility and impulsive behavior are core symptoms of BD (APA, 2013) and BD is strongly associated with impulsivity, both during acute manic episodes and more generally (Najt et al., 2007). Thus, it makes sense that the MDQ would be sensitive to these aspects of emotion dysregulation. However, as the associations with psychopathology suggest, these difficulties are not unique to BD, but experienced by individuals with a range of different disorders. Negative Activation, then, may be an indicator of risk for engaging in impulsive behavior in emotional situations. Potentially, it may overlap with other constructs (e.g., negative urgency) that have been shown to tap into this broader transdiagnostic process (e.g., Berg, Latzman, Bliwise, & Lilienfeld, 2015; Johnson, Carver, & Joormann, 2013).

The CFA results add to a growing body of evidence that the MDQ is a multidimensional measure (e.g., Bech et al., 2011; Benazzi et al., 2003; Jon et al., 2009; Kiejna et al., 2010; Stanton & Watson, 2017). The two factors highlight the dual nature of mania, which is comprised of both hedonically pleasant (e.g., euphoria, more energy, more confidence) and unpleasant (e.g., racing thoughts, irritability) symptoms. This duality is further supported by the fact that Negative Activation was associated with greater ratings of problem severity, while

Positive Activation was associated with reduced severity. However, Positive Activation was no longer associated with impairment/distress when the sample was restricted to individuals with BD. Thus, while individuals without BD who were high in Positive Activation saw their symptoms as less distressing, this was not true for BD individuals. However, this null association should be interpreted with caution, especially as there were only 150 participants with BD.

Our finding that Positive Activation was negatively associated with impairment ratings in the full sample is interesting and may suggest potential challenges when screening for hypomania/mania history. On this note, Stanton and Watson (2017) found that, at the bivariate level, MDQ Positive Activation symptoms were, in fact, moderately and positively correlated with impairment ratings; however, when adjusting for overlapping Negative Activation scores, this association became weakly *negative* in direction. Other research using the IDAS-II (Watson, Clark, Chmielewski, & Kotov, 2013) also underscores the complex nature of hypomanic/manic symptoms. That is, findings presented by Watson et al. (2013) indicate that hypomanic/manic symptoms related to euphoric mood (i.e., many of those overlapping with Positive Activation) appear strongly and positively related to ratings of well-being; interestingly, after controlling for general distress, associations between euphoric mood and well-being actually tend to *increase* in magnitude (see Watson et al., 2013 for further discussion of what they term "suppressor effects"). Thus, when considered with other findings, our results raise questions regarding the degree to which Positive Activation symptoms are adaptive versus maladaptive in nature. On the one hand, they appear to show considerable specificity to BD based on our findings and others (Watson et al., 2013; Stanton et al., 2019), but on the other, they may be positively related to well-being and negatively to some other disorders (i.e., depressive disorders, PTSD, and alcohol and cocaine use disorders). This relates to long-standing debate

and study of the degree to which Positive Activation symptoms have some adaptive qualities, as well as issues regarding the degree to which individuals reporting symptoms related to Positive Activation have insight into the problems or dysfunction caused by these symptoms (Gruber, 2011). Consequently, future work should continue to examine the relationship of Positive Activation, participants' insight into the nature of their symptoms, and functional impairment.

The current results suggest that focusing only on a positive screen or total score for the MDQ may risk conflating participants with significantly different symptom profiles (i.e., those who experience more hedonically positive versus negative symptoms of mania). As indicated by the present results and past work, BD is a highly heterogeneous diagnosis, sharing features with internalizing (e.g., racing thoughts, sleep disturbance), externalizing (e.g., impulsivity), and thought disorders (e.g., grandiosity; Andrews et al., 2009; Kotov et al., 2017). Future work should examine the implications of experiencing more positive versus negative symptoms of BD, which may vary both between individuals and also across episodes. Most important may be implications for treatment, as, for example, individuals with more negative symptoms may be more likely to voluntarily present for treatment, due to the aversive nature of their symptoms. More generally, research is needed to clarify if the diverse symptom types included in *DSM* hypomania/mania criteria and assessed by measures such as the MDQ have distinctive longitudinal courses, treatment response, and associations with impairment.

Relying on the overall MDQ also risks obscuring the impact of comorbid disorders, or, at worst, may even lead to miscategorization of individuals as having BD when they have unipolar depression, BPD, or another disorder that leads them to score highly on Negative Activation (Stanton et al., 2019). Diagnostic overlap of bipolar and other disorders has long been and still remains a significant issue in the field (George, Miklowitz, Richards, Simoneau, & Taylor, 2003;

Frances & Jones, 2012; McElroy et al., 2001). It is especially challenging to determine the appropriate diagnosis in patients who are not currently manic or hypomanic, but who report experiencing symptoms in the past that are congruent with mania/hypomania. It is difficult for patients to retrospectively determine whether their past bad moods, risky behaviors, and racing thoughts are attributable to hypomania/mania versus other conditions. While difficult to disentangle, the issue of comorbidity is highly important, as it has significant implications for treatment and the quality of patients' lives.

The current findings suggest that the MDQ should be treated as having two subscales, and that caution should be given when interpreting elevated scores on Negative Activation. Further screening may be indicated in these cases, especially in the absence of Positive Activation symptoms. Going forward, it will be important to determine how positive or negative screening status on the MDQ should account for the emergence of distinct Positive and Negative Activation dimensions. Specifically, it will be important to determine if there should be separate screening "cutoffs" for subscales representing these two dimensions and if high scores on both dimensions are necessary for a positive screen, among other issues.

We note that it makes sense in many ways that the MDQ includes a heterogenous range of content broadly related to BD given (a) its intended purpose as a screening measure and (b) the fact that it was modeled after *DSM* hypomania/mania criteria, which themselves are very heterogeneous (Hirschfeld et al., 2000). As a screening instrument, the MDQ should be broad, so as to minimize the number of cases that are "missed." Ideally, more comprehensive assessment of BD would then take place as warranted. However, the MDQ often is misapplied as a case finding instrument (i.e., used to make diagnosis; see Zimmerman, 2012), in which case such assessment does not take place.

Limitations, future directions, and conclusions

The current study had significant strengths, including the use of a large clinically diagnosed sample to replicate past work. There is a significant need for more replication work in clinical psychology (Tackett et al., 2017). There were also limitations. First, this study did not examine the use of the MDQ as a case finding rather than screening instrument (e.g., Zimmerman, 2012); the current findings that the MDQ is composed of multiple factors adds to the concern of using the MDQ for a case finding purpose. Second, while the sample overall was large, the number of individuals with a BD diagnosis was relatively small, though within what would be expected for an outpatient sample. We also had a greater number of patients with BD patients than past work on the factor structure of the MDQ (i.e., Benazzi & Akiskal, 2003; Bech et al., 2011). Third, the sample was overwhelmingly White (88.1%) and future studies should examine whether the results replicate in a more diverse sample. Fourth, the concurrent symptom item of the MDQ, as a dichotomous item, is limited in the degree to which it is able to fully quantify whether participants experienced symptoms as part of the same episode. This is further complicated by the fact that it asks whether "several" symptoms had occurred in the same period of time, leaving it to the participant to interpret the meaning of "several." Finally, the current results were based on retrospective self-report of past manic symptoms. While this is the intended use of the MDQ, it would be valuable to track MDQ scores longitudinally and to examine how report of positive and negative symptoms may shift over time as participants are closer or further away from manic episodes.

Despite these limitations, the current findings replicate past work indicating that the MDQ is composed of Positive and Negative Activation factors. Importantly, these factors have differential patterns of association with forms of psychopathology. While Positive Activation

was positively related specifically to BD, Negative Activation was related to a broad range of disorders, many characterized by emotion dysregulation (e.g., depressive disorders, PDs, PTSD, GAD) and transdiagnostic personality traits such as neuroticism and disinhibition (e.g., PDs, substance use disorders). The findings suggest that relying on a MDQ positive screen or total score risks conflating individuals with highly different symptom profiles. In particular, elevated scores on Negative Activation may indicate a need for additional screening and more careful consideration of treatment options, particularly in the absence of elevations on Positive Activation. Negative Activation may also specifically assess components of emotion dysregulation specifically related to appropriately regulating behavior when experiencing negative emotions, potentially connoting risk for a range of psychopathology.

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Table 1. Correlation matrix and descriptive statistics for Mood Disorder Questionnaire items.

Variables	*N* endorsed	*%*	1	2	3	4	5	6	7	8	9	10
1. MDQ 1: Felt so hyper you got into trouble	458	25.89	-									
2. MDQ 2: Very irritable	967	54.42	.31	-								
3. MDQ 3: Much more self-confident	667	37.77	.42	.24	-							
4. MDQ 4: Needed much less sleep than usual	560	31.67	.33	.21	.35	-						
5. MDQ 6: Thoughts/mind raced	1,123	63.37	.32	.34	.25	.28	-					
6. MDQ 7: Very easily distracted	1,150	64.97	.28	.31	.22	.20	.45	-				
7. MDQ 8: Had much more energy than usual	626	35.33	.47	.23	.55	.41	.29	.22	-			
8. MDQ 9: Much more active than usual	643	36.55	.42	.21	.53	.40	.30	.23	.72	-		
9. MDQ 12: Did things that were risky or foolish	507	28.64	.46	.28	.36	.32	.29	.27	.37	.38	-	
10. MDQ 13: Spending money got you or others in trouble	417	23.59	.34	.23	.25	.20	.19	.19	.26	.24	.35	

Note: N = 1,787. MDQ = Mood Disorder Questionnaire. All correlations were significant at $p < .001$. As MDQ items were dichotomous, phi coefficients were calculated, which are equivalent to Pearson correlation coefficients in the case of two dichotomous variables.

Table 2. Associations of Factor 1 (positive activation) and Factor 2 (negative activation) of the Mood Disorder Questionnaire and psychopathology.

	Prevalence		Factor 1		Factor 2	
	N	%	OR	95% CI	OR	95% CI
Mood disorders						
Depressive disorders[a]	1,132	63.35	0.56***	[0.42, 0.75]	1.99**	[1.31, 3.04]
Bipolar disorders[b]	150	8.39	2.95***	[1.61, 5.44]	13.19***	[5.26, 33.05]
Anxiety disorders						
Social anxiety	569	31.84	1.23	[0.92, 1.64]	1.29	[0.84, 1.98]
Panic	438	24.51	0.83	[0.60, 1.14]	2.18**	[1.36, 3.50]
Generalized anxiety	454	25.41	1.03	[0.75, 1.40]	1.67*	[1.05, 2.65]
Post-traumatic stress	328	18.35	0.55**	[0.38, 0.80]	5.62***	[3.26, 9.67]
Obsessive compulsive	143	8.00	0.90	[0.54, 1.48]	1.39	[0.67, 2.91]
Personality disorders						
Borderline	181	10.13	0.78	[0.48, 1.27]	16.31***	[7.55, 35.22]
Avoidant	107	6.01	0.58	[0.32, 1.03]	3.41**	[1.45, 8.03]
Obsessive-Compulsive	51	2.88	0.78	[0.35, 1.76]	5.31**	[1.54, 18.26]
Any other PD[c]	74	4.15	0.52	[0.26, 1.03]	9.93***	[3.45, 28.64]
Substance use disorders						
Alcohol	684	38.28	0.67**	[0.50, 0.89]	4.71***	[3.06, 7.24]
Marijuana	278	15.56	0.75	[0.51, 1.10]	4.13***	[2.33, 7.33]
Cocaine	111	6.21	0.52*	[0.30, 0.92]	5.79***	[2.48, 13.52]
Opioid	71	3.97	1.20	[0.60, 2.38]	2.04	[0.73, 5.68]
Polydrug	78	4.36	0.71	[0.36, 1.37]	4.78**	[1.76, 12.99]
Any other drug[d]	72	4.03	0.65	[0.32, 1.30]	2.52	[0.91, 7.01]
Eating disorders						
Any[e]	137	7.67	0.94	[0.56, 1.57]	2.63*	[1.22, 5.66]

Note. All disorders were lifetime and dichotomous indicators (0 = absent, 1 = present). Substance use disorders were combined abuse and dependence diagnoses (0 = no abuse or dependence, 1 = abuse and/or dependence). [a]Depressive disorders included major depressive disorder and dysthymia. [b]Bipolar disorders included bipolar I, bipolar II, and cyclothymia. [c]Any other PD included narcissistic, histrionic, antisocial, dependent, paranoid, schizoid, and schizotypal personality disorders. [d]Any other drug use disorder included amphetamine, hallucinogen, inhalant, sedative, and other drug use disorders. [e]Any eating disorder included anorexia nervosa, bulimia nervosa, and binge eating disorder. Covariates in the model consisted of sex and age (sample centered). * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 3. Item-level Factor Loadings for the Mood Disorder Questionnaire.

Factor	Item	Estimate	SE	R^2
Positive Activation	3. Much more self-confident	.816	.017	.67
	4. Needed much less sleep than usual	.693	.023	.48
	8. Had much more energy than usual	.956	.010	.91
	9. Much more active than usual	.930	.011	.87
Negative Activation	1. Felt so hyper you got into trouble	.901	.018	.81
	2. Very irritable	.604	.025	.37
	6. Thoughts/mind raced	.736	.023	.54
	7. Very easily distracted	.655	.025	.43
	12. Did things that were risky or foolish	.792	.021	.63
	13. Spending money got you or others in trouble	.609	.029	.37

Note. N = 1,787. All values are standardized coefficients. All factor loadings were significant at p <.001.

Table 4. *Results of linear regression examining the association of Difficulties in Emotion Regulation Scales (DERS) subscales and Negative Activation.*

	DV: Negative Activation				**DV: Positive Activation**			
	Est.	*95% CI*	*β*	*t*	*Est.*	*95% CI*	*β*	*t*
Intercept	-0.35	[-0.42, -0.29]		-10.67***	0.34	[0.23, 0.44]		6.20***
DERS-Nonacceptance	-0.002	[-0.005, 0.001]	-0.02	-1.05	0.002	[-0.003, 0.01]	0.02	0.89
DERS-Goals	0.01	[0.004, 0.01]	0.08	3.82***	-0.01	[-0.01, -0.001]	-0.05	-2.23*
DERS-Impulse	0.01	[0.004, 0.01]	0.09	4.43***	-0.003	[-0.01, 0.002]	-0.02	-1.05
DERS-Awareness	0.002	[-0.001, 0.01]	0.02	1.38	-0.01	[-0.01, < 0.00]	-0.04	-1.96*
DERS-Strategies	0.002	[-0.001, 0.01]	0.03	1.27	-0.003	[-0.01, 0.002]	-0.03	-1.13
DERS-Clarity	0.003	[-0.001, 0.01]	0.03	1.32	0.0005	[-0.01, 0.01]	0.003	0.13
Covariates								
Gender	-0.04	[-0.06, -0.01]	-0.04	-2.51*	-0.003	[-0.05, 0.04]	-0.002	-0.14
Age	-0.001	[-0.002, -0.0001]	-0.03	-2.07*	0.0002	[-0.001, 0.002]	0.004	0.29
Positive/Negative Activation	0.55	[0.53, 0.57]	0.81	52.96***	1.37	[1.32, 1.42]	0.92	52.96***

Note. $N = 948$. * $p < .05$. ** $p < .01$. *** $p < .001$.