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Is energy a stronger indicator of mood for those with bipolar disorder compared to those without bipolar disorder?

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ABSTRACT

Theory and research indicate that activity is fundamental to mood episodes in bipolar disorder (BD), yet researchers have not tested whether energy is more closely tethered to mood in BD compared to those without BD. Eighty-seven participants (13 with self-reported BD) completed 4396 energy and mood ratings through a mood-monitoring application. Mixed modeling analyses indicated that low energy, but not high energy, was related to mood within the BD group. Low energy could provide a strong and easily recognized indicator of negative mood states in persons with BD.

1. Introduction

Over 40 years ago, Beigel and Murphy (1971a) argued that activity was more central than mood in the phenomenology of bipolar disorder (BD), and this conceptualization has been echoed by other theories (Bauer et al., 1991; Akiskal et al., 2001). Empirical research supports increased activity and energy as core manic features. That is, multiple factor analytic studies indicate that activation is a core dimension of manic symptoms (Bauer et al., 1991; Cassidy et al., 1998; Akiskal et al., 2001). Factor scores for activation have been found to be the best symptom dimension for differentiating manic from depressed or control participants (Bauer et al., 1991) and to be robust correlates of clinician ratings of manic severity (Akiskal et al., 2001). Similarly, energy and activity were found to differentiate levels of manic severity more than did mood symptoms (Cheniaux et al., 2014).

Because patients might recognize shifts in activity more easily than mood changes, it has been argued that diagnostic accuracy might be improved by a focus on activity changes (Akiskal et al., 2001). Beyond self-ratings, observable changes in activity might be a more reliable behavioral target than would mood state. Accordingly, increased activity has been promoted to a core criterion of manic episodes in the DSM-5 (APA, 2013).

Persons with BD appear to see excessive activity as a central indicator of their mood state and a target for self-management. In a survey of people identified as coping well with BD, more than half reported "modifying excessive behavior and restraining self", and "engaging in calming activities" in response to early signs of mania (Lam and Wong, 1997). Greater use of these strategies predicted less mania over time (Lam et al., 2001). Consistent with this idea, greater daily activity as measured with actigraphy has been found to be correlated with mania (Wehr et al., 1982; Minassian et al., 2010) and to predict manic relapse (Klein et al., 1992).

Beyond mania, there is considerable reason to consider activity within bipolar depression. In the few available drug wash-out studies comparing bipolar and unipolar depression (see Cuellar et al., 2005), diminished activity is one of the few symptomatology variables that consistently differentiates those with BD from unipolar disorder (Beigel and Murphy, 1971b; Kupfer et al., 1974; Katz et al., 1982; marginal effects in Kuhs and Reschke, 1992). Consistent with evidence that people with BD tend to experience chronic subsyndromal depression (e.g., Judd and Akiskal, 2003; Kupka et al., 2007), persons with BD show lower activity as measured using actigraphy than control participants do (Harvey et al., 2005; Jones et al., 2005; Salvatore et al., 2008; St. Amand et al., 2013).

The above literature suggests that activity may be a core component of mood state within BD. Nonetheless, researchers have not tested whether energy is more closely tethered to mood state within BD compared to those with no mood disorder. The current study provides one of the first longitudinal examinations

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of energy as an index of mood fluctuations within persons with BD. We hypothesized energy and mood ratings would be more strongly correlated within persons with BD compared to those without BD, as assessed using within-subject correlations of self-ratings of energy and mood.

2. Method

Data were gathered through a mood-monitoring application (not specific to BD) available online called In Flow (http://www.inflow.mobi/). Approximately 3200 persons who had downloaded the application received an email inviting study participation. Interested persons, who confirmed age of 18 or older and completed written informed consent procedures, were asked whether they had ever been diagnosed with BD and agreed to have their anonymous data uploaded. The sample consisted of 13 participants with self-reported BD (Mean age=33.4, SD=8.4, range=23–51, 9 females) and 74 participants who did not endorse a history of BD (Mean age=31.8, SD=8.3, range=18–55, 39 females). Other medical or diagnostic conditions were not assessed. Groups did not differ significantly in age, $t(85)=0.775$, $p=0.441$, or gender, $\chi^2=0.122$, $p=0.37$. Of the 13 bipolar participants, four participants reported a bipolar I diagnosis, eight a bipolar II diagnosis, and one did not report bipolar type. Because persons were free to rate their energy and mood at the interval of their choice, the frequency and timing of assessments varied across individuals. A pictorial dial was used to separately rate energy and mood, using scales ranging from −3 to 3 (see Fig. 1). Valence of mood was depicted using down-turned, neutral, or up-turned mouth graphics; energy was rated using eye and eyebrow changes that were labeled as a person moved the dial (e.g., great and active). Seven-point ratings of mood have been shown to correlate highly with interview-based depression ratings within bipolar participants (Farhoult-Jepsen et al., 2014).

Participants with BD provided 496 energy and mood ratings (Median=19, range=1–186, Mean $_{\text{energy rating}}=-0.76$, SD=1.53 and Mean $_{\text{mood rating}}=0.08$, SD=1.24). Although most BD participants completed their ratings within one month, one participant completed his/her 186 ratings over the course of 191 days. The 74 participants with no BD provided 3899 energy and mood ratings (Median=24.5, range=1 to 366, Mean $_{\text{energy rating}}=0.07$, SD=1.43 and Mean $_{\text{mood rating}}=0.75$, SD=1.14). Within the non-BD group, 56.5% of participants completed their ratings within one month, 74.3% within 2 months or less, and only 2 participants completed ratings for over one year. Almost all participants completed ratings at least once per week. The mean number of observations per person did not differ significantly between the BD and the non-BD group, $t(85)=0.73$, $p=0.47$, nor by bipolar type, $F(2,10)=0.738$, $p=0.503$.

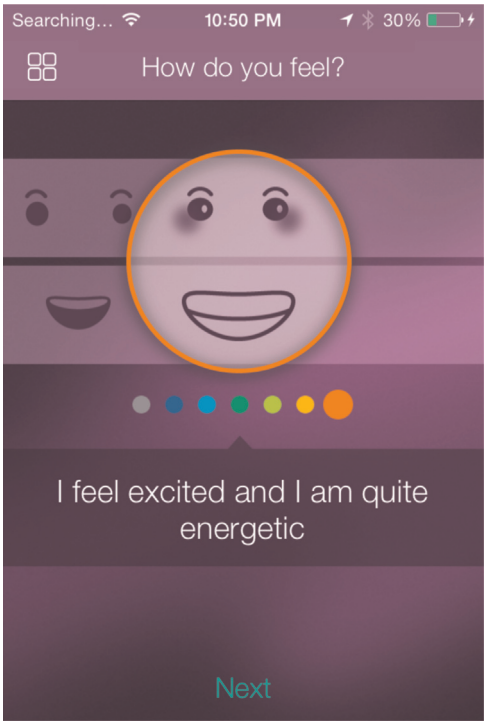

Fig. 1. Screen Shot of the App.

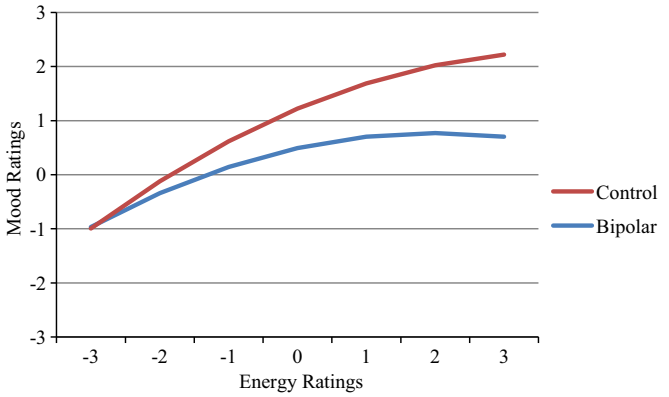

Fig. 2. The relationship between energy and mood .

2.1. Analyses

Mixed modeling (SPSS version 21.0, IBM Corp., Armonk, NY) was used to examine the effects of energy on mood. Mixed modeling is a form of correlational analysis that accounts for repeated measurements within subjects, while allowing for missing data, uneven spacing of repeated measurements, and minor violations of normalcy. We predicted an interaction of group with energy in predicting mood. Because previous research has suggested curvilinear effects in mood and energy ratings within BD (Johnson et al., 2011), we tested linear and curvilinear (quadratic) effects of energy (E^2).

3. Results

Mixed models analyses indicated that the BD group reported significantly lower energy than the no BD group, $F(4395)=40.673$, $p<0.0001$ (see Fig. 2). Energy, $t(4395)=7.587$, $p<0.0001$ and the curvilinear (quadratic) effect of energy, $t(4395)=-3.399$, $p=0.001$ both had significant correlations with mood. As shown in Fig. 2, higher energy ratings were related to more positive mood ratings, $t(4395)=7.587$, $p<0.0001$. The interaction of group with the linear effect of energy was not significant, $t(4395)=-0.559$, $p=0.58$. There was also a curvilinear effect of energy on mood, but this was qualified by a significant interaction of the curvilinear effect of energy with group status, $t(4395)=3.281$, $p=0.001$. To examine this Group × Curvilinear energy interaction, we calculated models for the BD and no BD groups separately. The curvilinear effect of energy was significant for the BD group, $t(496)=-0.310$, $p=0.001$, but not for the no BD group, $t(3899)=0.223$, $p=0.823$. This is reflected in the greater degree of curve shown in Fig. 2 for the BD group than the no BD group. To provide greater detail on the curvilinear effect found within the BD group, contrasts (df=496) were conducted to examine the effect of each non-zero energy level, relative to an energy rating of 0, on ratings of mood. These suggested highly significant effects on mood at the lowest energy ratings of −3 and -2 (contrasts=−1.59 and −1.16, respectively, both p's<0.001), more modest effects at energy ratings of -1 or 1 (contrasts=−0.40 and −0.41 respectively, both p's=0.02) and nonsignificant effects at energy ratings of 2 or 3 as compared to 0 (contrasts=0.10 and 0.51 respectively, ns). In sum, examination of the curvilinear effect of energy on mood within the BD group indicated that effects were significant at low but not high levels of energy.

4. Discussion

Clinical observation and research suggest that hyperactivity might be more central to mania than heightened mood is, whereas low activation may be a distinctive feature of bipolar depression