Research paper

Associations between circadian rhythm instability, appraisal style and mood in bipolar disorder

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ABSTRACT

Background: Internal appraisal styles, in addition to circadian and social rhythm instability, have been implicated in the development of mood experiences in bipolar disorder (BD), yet potential interactions between these variables remain under researched.
Methods: This study used online questionnaires to examine relationships between social and circadian rhythm instability, appraisal style and mood within populations at varying vulnerability for BD.
Results: Participants with BD (n=51), and those at behavioural high-risk (BHR; n=77), exhibited poor sleep quality and a stronger tendency to form internal appraisals of both positive and negative experiences compared to non-clinical controls (n=498) and participants with fibromyalgia (n=80). Participants with BD also exhibited a stronger tendency to adopt an internal, negative appraisal style compared to individuals at BHR. Sleep disturbance and internal appraisal styles were significantly associated with low mood in BD.
Limitations: Sleep quality and social rhythm stability were assessed using self-report measures only, which may differ from objective measures. Causal relationships between constructs could not be examined due to the cross-sectional design.
Conclusions: The findings suggest the importance of attending to internal appraisal styles and sleep quality when working therapeutically with individuals diagnosed with BD. Potential differences in the effect of appraisal style at the state and trait level warrant further exploration.

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1. Introduction

BD is characterized by significant fluctuations in both sleep and physical activity. During mania, increased motor activity along with a decreased need for sleep are common, whereas during depression, both insomnia and hypersomnia may be present, along with slowed psychomotor activity (American Psychiatric Association, 2013). Goodwin and Jamison (2007) propose that risk of developing BD may be associated with circadian rhythm (CR) instability (i.e. sleep and activity patterns which are hyper-sensitive to disrupting events), and that the onset of mood episodes in clinical populations is triggered by circadian rhythm disruption.

The relationship between circadian instability and mood change in BD appears to be bi-directional (Harvey, 2008), with CR disruption triggering extreme shifts in mood leading to behaviors which further exacerbate CR disruption. Prospective relationships

between CR disruption and bipolar mood episodes have been reported (Jackson et al., 2003; Murray, 2006; Proudfoot et al., 2011), as well as CR disturbance during euthymia (Gershon et al., 2012; Saunders et al., 2013; Sylvia et al., 2012).

CRs are strongly linked to social rhythms, i.e. routines such as getting up, having breakfast and going to work (Monk et al., 1990). According to the social zeitgeber hypothesis (Ehlers et al., 1988), social rhythm disturbance disrupts CRs which then triggers bipolar mood episodes in vulnerable individuals. This is supported by evidence of low social rhythm regularity within both diagnosed (Sylvia et al., 2009; Boland et al., 2012; St-Amand et al., 2013), and BHR populations (Meyer and Maier, 2006; Bullock et al., 2011).

The process by which CR disturbance triggers mood change remains unclear. Jones (2001) proposed a multilevel cognitive model of BD which integrated the instability model with principles from the Schematic Propositional Analogical Associative Representation Systems (SPAARS) model of emotion (Power and Dalgleish, 1997). The SPAARS model proposes that emotions are generated by information processed at multiple levels of cognition. Specifically, events cause changes to the analogical system (i.e. the senses), which are interpreted at multiple, interacting levels of

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cognition resulting in changes in emotional states. Following this model, Jones (2001) suggested that BD is associated with an internal cognitive bias, in which CR disruptions are interpreted as personally relevant. Internal interpretations of this type then trigger extreme mood states, leading to behaviors which cause further CR disruption in a vicious cycle.

Consistent with Jones (2001) model, people with BD and people at behavioural high-risk tend to form internal appraisals of mood-relevant experiences (Alatiq et al., 2010; Ankers and Jones, 2009; Dodd et al., 2011; Mansell et al., 2011). However, investigations of concurrent relationships between cognitive styles, CR disturbance, and mood in BD are lacking, and only two studies have explored these factors in high-risk populations (Jones et al., 2006b; Ankers and Jones, 2009). Research in this area is needed to inform understanding of the development and maintenance of bipolar experiences, and suggest potential avenues for clinical intervention. It is also unclear whether a proposed relationship between CR disturbance and internal appraisal style is unique to BD. To investigate the specificity of this association, we studied a comparison group of people with fibromyalgia, as such individuals exhibit similar CR disruption to that documented in BD (Korszun, 2000; Lineberger et al., 2007).

It was hypothesized that non-clinical controls would demonstrate better sleep quality and social rhythm regularity than the other three groups (i.e. BD, fibromyalgia and high-risk), whilst the two clinical groups (i.e. BD and fibromyalgia) would exhibit similar CR instability (i.e. poor sleep quality and low social rhythm regularity). It was also hypothesized that bipolar and high-risk participants would demonstrate a tendency to form internal appraisals of hypomanic and depressive experiences, with higher mood symptom scores in the bipolar group compared to the other three groups. In line with Jones (2001) adaptation of the SPAARS model, it was anticipated that internal appraisal style would serve as a moderator in the relationship between rhythm instability and mood, with internal appraisals strengthening this relationship.

2. Method

2.1. Participants

Participants were recruited via online adverts on internet forums and social media sites, in addition to posters and newsletters circulated around universities across the North West.

Non-clinical controls and BHR individuals were identified based upon their scores on the Hypomanic Personality Scale (HPS; Eckblad and Chapman, 1986). Consistent with previous studies (Ankers and Jones, 2009; Eckblad and Chapman, 1986; Meyer and Hautzinger, 2003), those scoring within the highest decile of the distribution formed the BHR group (i.e. scores of 22–48) whilst those scoring no higher than the sample mean plus half a standard deviation (i.e. scores of 0–15) formed the non-clinical control group. Bipolar and fibromyalgia participants were identified by a self-reported diagnosis of bipolar disorder or fibromyalgia respectively, by a health professional.

Exclusion criteria for all participants included; i) a lifetime diagnosis of schizophrenia or a personality disorder; ii) a diagnosis of dementia; iii) a diagnosis of a physical brain injury, and; iv) currently working night shifts. In an attempt to control for the effects of clinically significant psychological disorders in the non-clinical and FM groups, participants who reported suffering from any mental health problem in the last 2 years (e.g. anxiety, depression) were excluded from the survey. With the exception of FM participants, any participants who reported a current diagnosis of a chronic pain disorder by a health professional were also excluded.

The Mood Disorders Questionnaire (MDQ; Hirschfeld et al., 2000) was used to confirm the presence or absence of a self-reported BD diagnosis given by a mental health professional. BHR participants who scored positively were not excluded due to the poor sensitivity of the MDQ within general population samples (Zimmerman and Galione, 2011), and rates of undiagnosed mood disorders in high-risk populations (Bentall et al., 2011; MacKinnon et al., 2002; Wals et al., 2001).

Non-clinical participants who reported using psychotropic medication such as anti-depressants, mood stabilisers, and hypnotics, were excluded. FM participants taking anti-depressants were not excluded as anti-depressants are commonly prescribed to treat physical symptoms (Carville et al., 2008; Häuser et al., 2009).

2.2. Procedure

The study received ethical approval from the Lancaster North West NHS Research Ethics Committee. Upon visiting the online survey homepage, participants read the study information and consented to take part. A series of eligibility screening questions then followed which served to identify the presence of relevant diagnoses in line with the exclusion criteria (e.g. 'Have you ever received a diagnosis of schizophrenia by a mental health professional?').. Eligible participants provided demographic information (i.e. age, gender, employment status, marital status, medication use), and completed the survey measures.

2.3. Data screening

Fig. 1 outlines the procedure for screening survey responses.

Where the same participant had responded to the survey more than once (i.e. duplicates), only the most recent entry was retained. Participants who did not complete any of the core measures were excluded. In line with previous studies (Johnson and Carver, 2012; Johnson and Jones, 2009; Giovanelli et al., 2013), four 'catch items' were included in the survey. Data sets which contained at least one incorrect response to a catch item were excluded.

2.4. Measures

2.4.1. Measures of risk for BD
2.4.1.1. HPS (Eckblad and Chapman, 1986). The HPS is a 48-item true or false measure assessing hypomanic personality; 'a gregarious and overactive disposition' (Eckblad and Chapman, 1986), including items such as "Sometimes ideas and insights come to me so fast that I cannot express them all", and "When with groups of people, I usually prefer to let someone else be the centre of attention". It is a widely used screening tool for behavioural risk of BD, and has good test-retest reliability (Pearson's $r=0.81$) in addition to high internal consistency (Cronbach's Alpha $=0.87$; Eckblad and Chapman, 1986).

2.4.1.2. MDQ (Hirschfeld et al., 2000). The MDQ is a screening tool for detecting BD, with good internal consistency within UK samples (Cronbach's Alpha $=0.91$; Twiss et al., 2008). It contains 13 yes/no items relating to symptoms of mania, followed by two questions to assess whether or not the symptoms were experienced within the same period, and what impairment these symptoms caused. For the present study, improvements in sensitivity were prioritized over specificity due to the focus on the bipolar sample over the other three comparison groups. Therefore the Benazzi (2003) scoring algorithm was applied, such that participants had to report experiencing at least 7 of the 13 symptoms of mania within the same time period to score positively on the