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Associations between sleep disturbance, cognitive functioning and work disability in Bipolar Disorder

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ABSTRACT

Bipolar Disorder (BD) is associated with impairment in a number of areas including poor work functioning, often despite the remission of mood symptoms. The present study aimed to examine the role of sleep disturbance and cognitive functioning in occupational impairment in BD. Twenty-four euthymic BD participants and 24 healthy control participants completed a week of prospective assessment of sleep disruption via self-report and actigraphy, a battery of neuropsychological tests of executive functioning, working memory, and verbal learning, and assessments of work functioning. BD participants experienced significantly poorer cognitive functioning as well as greater months of unemployment and greater incidence of being fired than controls. Moderation analyses revealed that both poor sleep and cognitive functioning were associated with poor work performance in BD participants, but not control participants. Sleep and cognitive functioning may be impaired in euthymic BD and are associated with poor work functioning in this population. More research should be conducted to better understand how sleep and cognitive functioning may interact in BD.

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1. Introduction

Bipolar Disorder (BD) is a chronic, highly recurrent and debilitating condition affecting roughly 5.7 million adults in the United States (National Institute of Mental Health, 2011). Indeed, the World Health Organization ranks BD as the sixth leading cause of disability in the world (World Health Organization [WHO], 2006). Reports of poor work performance and high rates of utilization of disability income are frequent in the literature (Judd et al., 2005, 2008). However, research is mixed regarding the underpinnings of this sustained dysfunction (see Sanchez-Moreno et al., 2009 for a thorough review), thus necessitating further research into which variables might be the best predictors of functioning in BD.

The most robust clinical predictor of long-term functional impairment is subsyndromal depressive symptoms (Altshuler et al., 2002; Fagiolini et al., 2005; Judd et al., 2005; Bonnín et al., 2010), although studies also have shown associations between older age, presence of mixed episodes, and increased number of previous hospitalizations and poor functioning (Rosa et al., 2009). Comparatively understudied are the contributions of cognitive functioning and sleep to sustained work disability, as both are often found to be impaired despite remission of mood symptoms and may in fact be inter-related (see Boland and Alloy, 2013 for a review of the theoretical relationship between sleep and neurocognition in BD). Numerous reports point to widespread cognitive deficits in the euthymic phase of BD, including deficits in verbal memory, verbal learning, attention, and executive functioning (Robinson et al., 2006; Torres et al., 2007; Arts et al., 2008, Bora et al., 2009; Kurtz and Gerraty, 2009; Mann-Wrobel et al., 2011; Peters et al., 2014). Studies including indices of work performance in their analyses have consistently reported associations between work disability and verbal learning and memory (Dickerson et al., 2004; Martinez-Àran et al., 2004). Indeed, in a cross-sectional analysis, Martinez-Àran et al. (2004) found that in euthymic BD individuals, verbal learning deficits were associated with poor functional outcome, whereas clinical variables were not.

Research also points to persistent sleep disruption in the euthymic phase (Millar et al., 2004; Harvey et al., 2005). Sleep disturbance, including reduced need for sleep, increased sleep

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(hypersomnia), sleep fragmentation, and increased sleep onset latency, has been associated with poor functional outcomes in their broader sense, including poor quality of life, lower Global Assessment of Functioning (GAF) scores, and self-reported symptom s of daytime dysfunction as a consequence of sleep disturbance (Harvey et al., 2005; Giglio et al., 2009; Gruber et al., 2009). Only one study to date has specifically examined the role of sleep disturbance in work functioning in BD; however, this study only assessed subjective duration of sleep and found that both short and long duration of sleep was associated with poor work functioning in BD (Gruber et al., 2009).

The present study provides a focused examination of work disability by examining the relative contributions of sleep disturbance and cognitive impairment. We hypothesized that participants with BD would experience poorer cognitive and work functioning relative to healthy controls. BD participants in this study are compared to healthy sleepers, and although we expect BD participants to demonstrate poorer sleep relative to controls due to the study design, we hypothesize that scores on self-report measures of sleep disturbance and actigraphic assessments of sleep parameters for BD participants will reflect sleep disturbance based on known cutoff scores and values. Given the established chronicity of sleep and cognitive functioning impairments in BD, as well as frequent reports of overall poor functional outcomes in this population, we also hypothesized that sleep and cognitive functioning deficits would be associated with poor work performance among BD individuals more strongly than among healthy controls.

2. Method

2.1. Participants

Participants were 48 adults, aged 18–65 recruited from the Temple University campus and the greater Philadelphia community. Participants carried a diagnosis of bipolar I or II disorder in the euthymic phase or had no history of mood or sleep disorders, were willing to commit to a week of actigraphic assessment, and were able to read, write, and speak English. Exclusion criteria included active suicidal or homicidal ideation, current psychotic symptoms, baseline IQ below 70, and an uncontrolled severe medical condition.

2.2. Procedure

All procedures were approved by the Institutional Review Board of Temple University. In Phase I, 1954 individuals aged 18–65 completed screening questionnaires consisting of the General Behavior Inventory (GBI; Depue et al., 1989), a questionnaire assessing the severity and duration of affective symptoms, and the Insomnia Severity Index (ISI; Morin et al., 2011), a questionnaire assessing severity of insomnia symptoms. Eligible participants completed a psychiatric diagnostic interview (Schedule for Affective Disorders and Schizophrenia – Lifetime Version (SADS-L); Endicott and Spitzer, 1978), an interview of current insomnia symptoms, and self-reports of mood symptoms (Beck Depression Inventory [BDI]; Beck et al., 1996; Altman Self-Rating Mania Scale [ASRM]; Altman et al., 1997). Seventy-four participants were administered the diagnostic interview, from which 26 were disqualified for the following reasons: diagnosis of BD-NOS ($n=8$), diagnosis of cyclothymia ($n=4$), diagnosis of major depression ($n=8$), bipolar but symptomatic ($n=6$). Participants then completed a brief assessment of intellectual functioning (Kaufman Brief Intelligence Test; Kaufman and Kaufman, 1990).

Bipolar participants had to score ≥ 13 on the depression subscale and ≥ 11 on the hypomania/biphasic subscale of the GBI (Depue et al., 1989). Control participants had to score <7 on both the depression and hypomania subscales of the GBI and <7 on the ISI. Scores of 7 and below represent the lower quartile of the ISI, and would thus provide a good demonstration of satisfactory sleep. Individuals who endorsed any current or past mood disorder diagnosis or any current sleep disruption were excluded from the control group, as were individuals who reported satisfactory sleep via the use of sleeping medications. BD participants were included only if they scored <5 on the ASRM and <13 on the BDI.

Full study participants completed a Pittsburgh Sleep Quality Index (PSQI; see Section 2.3) and were fitted with an actigraph. Research has shown that the use of actigraphy is useful in the assessment of sleep/wake activity and that data collected via actigraphy is more accurate than data collected through standard sleep/wake diaries (Webster et al., 1982; Brooks et al., 1993; Sadeh, 1995; Ancoli-Israel et al., 2003). Actigraphy took place for one week prior to cognitive testing. Cognitive testing and work functioning assessment took place at Temple University at the culmination of the one-week actigraphy period. Cognitive and work functioning assessments were conducted by assistants who were blind to participants' group assignments as well as to actigraphy results.

2.3. Measures

2.3.1. Sleep measures

2.3.1.1. Insomnia Severity Index (ISI). The ISI (Morin et al., 2011) is a 7-item questionnaire used to assess the severity of insomnia symptoms utilizing a 5-point Likert-type scale. Internal consistency for this measure is excellent ($\alpha=0.90$) with good convergent validity (Morin et al., 2011). A study of the psychometrics of the ISI revealed a cutoff score of 10 to be adequate in community samples for the diagnosis of insomnia (Morin et al., 2011).

2.3.1.2. Unstructured clinical interview for insomnia. An unstructured clinical interview was utilized to diagnose primary insomnia. Interviewers collected data on sleep onset latency, total sleep time, number of mid-sleep and early-morning awakenings, symptoms of obstructive sleep apnea, nightmares, and sleep-related behaviors. Information on medical conditions was collected to determine if medical exclusion was warranted.

2.3.1.3. The Pittsburgh Sleep Quality Index (PSQI). The PSQI (Buysse et al., 1989) is a self-report measure that assesses sleep quality and disturbance over a one-month time interval. The measure generates component scores of subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. This measure has good internal consistency ($\alpha=0.83$) and test-retest reliability ($r=0.85$).

2.3.1.4. Actigraphy. All participants were equipped with wristwatch actigraphy for 7 days and nights. The device used was an Actiwatch AW-64 (Mini Mitter, Philips Respironics Inc., Bend, OR, USA). This device features a sensitivity of 0.05 g and a bandwidth between 3 and 11 Hz, with a sampling frequency of 32 Hz. Actigraphy data were stored in 15 s epochs for a continuous period of 7 days. Sleep onset data were analyzed using the Immobile Minutes algorithm in Actiware 5.57 (Mini Mitter Philips Respironics Inc.), which generated wake, rest, and sleep intervals for each participant for each night of actigraphy. Participants completed subjective sleep-wake diaries in addition to actigraphy. Sleep diaries required participants to log the time they got into bed, time they attempted to sleep, estimate of time to fall asleep, number of