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Research report

Does a history of substance abuse and illness chronicity predict increased impulsivity in bipolar disorder?

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ABSTRACT

Background: Impulsivity is a common feature shared by bipolar disorder (BD) and substance use disorder (SUD). SUD and recurrent mood episodes are considered to be risk factors for poor outcome in BD. However, the association between impulsivity, illness chronicity and SUD in BD remains unexplored.
Methods: 103 BD patients with and without a lifetime history of SUD (36.82 ± 11.34 years, 40 males) were recruited. Participants completed the SCID interview and were administered measures of impulsivity including the Barratt Impulsivity Scale (BIS) and selected tests of the Cambridge Neuropsychological Test Automated Battery (CANTAB). Hierarchical regression analyses explored the relationship between illness chronicity, SUD, and impulsivity.
Results: Variance in the BIS, number of false alarms on the Rapid Visual Processing task and other impulsivity indicators of the Cambridge Gambling Task (CGT) was not explained by the chosen variables. Only an increased number of commission errors in the negative condition of the Affective Go/No Go task was significantly associated with illness chronicity. Furthermore there was a trend suggesting a relationship between a lifetime history of SUD and increased propensity to risk-taking during the CGT.
Limitations: Potential limitations include medication and patients' remission status from SUD.
Conclusions: Contrary to our expectations impulsivity was generally not predicted by indicators of illness chronicity or SUD. While impulsivity could still be a marker of BD that is present before the onset of the disorder, the link between the number of mood episodes and specific indicators of impulsivity may be related to mechanisms of neuroprogression.

1. Introduction

Bipolar disorder (BD) is a serious mental illness clinically characterized by mood dysregulation, brain abnormalities, and cognitive deficits such as poor response inhibition that in some cases persist during the euthymic and acute phases (Bora et al., 2009; MacQueen et al., 2001; Quraishi and Frangou, 2002). The majority of BD patients also present with additional mental health conditions such as anxiety and substance use disorder (SUD) (Asaad et al., 2014; Merikangas et al., 2007) that are considered to be predictors of poor response to treatment (Swann, 2010) and low remission rates (Ostacher, 2011) in BD and SUD patients.

Impulsivity is a common feature shared by BD and SUD (Powers et al., 2013; Swann et al., 2007) and has been associated with poor cognitive control and disregard of the long-term implications of one's behavior, and may therefore result in risky and disorganized behaviors (Evenden, 1999; Moeller et al., 2001). Impulsivity can be considered as being a multidimensional concept and assessed via self-reports and behavioral paradigms. Previous studies showed that the Barratt Impulsivity Scale (BIS) total score (Patton et al., 1995) – a widely used self-rating measure of impulsivity in psychiatry – discriminates well between healthy subjects and euthymic BD patients (Ekinci et al., 2011; Etain et al., 2013). Additionally, BIS scores have been found to be significantly elevated in BD patients with a history of SUD (Etain et al., 2013).

The comparability and equivalence of self-rated and behavioral indicators of impulsivity is still equivocal (for review (Newman and Meyer, 2014)). A study found that euthymic BD patients encountered difficulties on behavioral measures of impulsivity such as the Hayling Sentence Completion (HSCT) and the Iowa Gambling Task (Christodoulou et al., 2006). Furthermore, the BIS score was found to correlate positively with the number of

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commission errors on the HSCT and the Iowa Gambling task. Two studies using the BIS alongside the Immediate Memory Task–Delayed Memory Task (IMT–DMT) – a modified version of the Continuous Performance Task (CPT) found that while the BIS scores were elevated in BD patients compared to healthy controls (the two studies included euthymic BD and BD patients with SUD respectively), the number of commission errors of the IMT–DMT was comparable between the two groups (Swann et al., 2004, 2003). Thus, not all facets of impulsivity discriminate between BD and healthy controls. Furthermore, the BIS and behavioral tasks may not capture the same aspects of impulsivity and might be differentially related to outcome measures such as the course or duration of the bipolar disorder.

The literature on the relationship between impulsivity, BD, and SUD is sparse, and it is unclear whether impulsivity is a marker of the bipolar disorder or rather the result of neural damage associated with repeated mood episodes and/or drug use. Theories of neuroprogression in mood disorders suggest that ongoing mood episodes lead to a state of chronic inflammation and eventually result in neurocognitive impairment (Berk et al., 2010, 2011; Kapczinski et al., 2008). Abusing drugs has negative effects on the brain reward mechanisms and on the dopaminergic and serotonergic neurotransmitter systems (Koob and Le Moal, 1997) and may induce hazardous reward seeking behaviors and poor decision making (Kirby et al., 2011). Therefore, a positive association between measures of impulsivity and illness chronicity in BD would support the notion that the levels of impulsivity increase as the bipolar disorder progresses. Similarly, a link between increased impulsivity levels and SUD would be related to the deleterious effects of drugs on the brain. By contrast if there was no relation among these measures, prior research would suggest that impulsivity is more likely to be a marker of BD, being present before the onset of the disorder.

Based on the evidence reviewed above the aim of this cross-sectional study is to investigate the predictive power of indicators of illness chronicity such as illness duration and the number of prior mood episodes on impulsivity in BD, and determine whether a history of SUD additionally explains elevations in impulsivity above and beyond indicators of illness chronicity. Further, we aim to determine whether self-ratings (i.e. BIS) and behavioral measures from the CANTAB battery measure heterogeneous or similar facets of impulsivity. Based on the literature we predict that 1. indicators of illness chronicity will explain variance in both self-rated and behavioral impulsivity measures and 2. that a history of SUD will significantly add to this effect.

2. Methods

2.1. Sample

The sample included 103 adult BD patients (M ± SD: 36.82 ± 11.34 years; 40 males, 63 females; 74 BD-I, 20 BD-II, and 9 BD-NOS) (see Table 1). Participants were recruited from inpatient and outpatient clinics of the University of North Carolina at Chapel Hill (UNC) and the University of Texas Health Science Center at Houston (UT). All patients met the DSM-IV-R criteria for BD. The diagnosis of BD among patients were ascertained by the Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorders Axis I (SCID I) (First et al., 2012), which was administered to all participants by an independent psychiatrist or trained research assistant. The interview also included the Hamilton Depression Rating Scale (HAM-D) (Hamilton, 1960) and the Young Mania Rating Scale (YMRS) (Young et al., 1978). Illness chronicity was defined by the number of mood episodes (including manic, depressive and mixed episodes) and illness duration. 44 Participants had a lifetime history of SUD and had previously met criteria for substance abuse or dependence. Subjects were excluded if they fulfilled criteria for SUD in 6 months prior to the beginning of the study or had any current serious medical problems including cardiovascular and neurological disorders. 43 BD participants took psychotropic medication at the time of enrollment. The study protocol was approved by the local Institutional Review board and informed consent was obtained from all the participants.

Table 1
Demographic and clinical characteristics of the sample.

Group	Mean (S.D.)
Age (years)	36.82 ± 11.34
Sex	40 Males 63 Females
Education (years)	13.9 ± 3.3
Full scale IQ (WASI)	110.74 ± 13.71
Age of onset	18.45 ± 8.16
BIS	76.49 ± 5.5
YMRS	5.08 ± 4.85
HAMD	12.67 ± 8.46
[a]Number of mood episodes	
< 13	$n=24$
> 13	$n=79$
Illness duration (years)	18.35 ± 11.71
[a]Lifetime history of substance and/or alcohol use disorder	Yes – $n=44$ No – $n=59$

[a] Notes: Absolute numbers might vary due to missing data; YMRS=Young Mania Rating Scale; HAMD: Hamilton Depression Rating Scale; BIS: Barratt Impulsivity Scale.

2.2. Impulsivity

The Barratt Impulsive Scale (BIS) (Patton et al., 1995) is a 30-item self-report measure of impulsivity that includes three scales: cognitive impulsivity – e.g. difficulties with concentrating, motor impulsiveness, e.g. motor restlessness and non-planning impulsiveness – e.g. self-control. The BIS has been often used in research in BD and was therefore chosen as a self-report. Behavioral aspects of impulsivity were measured by the Affective Go/No-Go task (AGN), the Cambridge Gambling Task (CGT), and the Rapid Visual Processing Task (RVP) of the computerized Cambridge Neurocognitive Test Automated Battery (CANTAB – http://www.cantab.com). This battery was chosen based on its established sensitivity to cognitive impairment in psychiatric disorders (Sweeney et al., 2000). The tasks of the CANTAB are briefly described below and a detailed description is given elsewhere (Robbins et al., 1994).

AGN evaluates inhibition control. Participants are instructed to respond to either happy (e.g. joyful, warmth, courage) or negative words (e.g. mistake, hopeless, burden), and inhibit their response to stimuli of opposite valence. Stimuli were presented in both a random (negative, positive, positive, negative) and sequential way (positive, positive, negative, negative). The outcome measure included in this report to reflect impulsivity is the number of commission errors in response to distracting stimuli.

CGT evaluates impulse control and risk-taking behavior. Primary outcome measures include deliberation time prior to making a bet, risk taking (mean proportion of the number of points risked on trials with a more likely outcome), quality of decision making (proportion of bets on gamble trials with a more likely outcome), and delay aversion (ratio score representing the ability to bet large amounts depending on the odds of winning/losing).

RVP evaluates sustained visual attention. The main outcome measure of this task in relation to the concept of impulsivity is the number of false alarms. Because none of the transformation positively affected its distribution towards greater normality (see below) this variable was coded into a dichotomous variable (1=presence of false alarms, 2=absence of false alarms).