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A prospective study of bipolar disorder vulnerability in relation to behavioural activation, behavioural inhibition and dysregulation of the Behavioural Activation System

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ABSTRACT

Background: The weak regulation, or "dysregulation", of the Behavioural Activation System (BAS) is implicated in the development and recurrence of bipolar disorder. However, there has been a lack of prospective studies investigating the predictive role of BAS dysregulation in relation to bipolar-vulnerability. Furthermore, no studies have tested the prospective predictive utility of the DYS self-report measure of BAS dysregulation in an analogue sample. The goal of the current study was to redress this gap.
Methods: Participants (n = 127) completed baseline self-report measures of mood symptoms (Internal States Scale [ISS]), the Hypomanic Personality Scale (HPS), behavioural activation, inhibition and dysregulation of BAS (BIS/BAS and DYS), and at six months, the Mood Disorders Questionnaire (MDQ).
Results: Linear regression analysis indicated a significant main effect of BAS Dysregulation, and a significant interaction between BIS and BAS Fun Seeking, on prospective MDQ scores whilst controlling for baseline mood symptoms and HPS scores. The interaction effect indicated that the relationship between high BAS Fun Seeking and follow-up MDQ scores was strongest when BIS scores were high, whilst the lowest MDQ scores were observed for a combination of low BAS Fun Seeking and high BIS. However, DYS scores were the stronger predictor of MDQ scores compared to the BAS Fun Seeking and BIS interaction.
Conclusions: Bipolar-vulnerability is prospectively associated with heightened BAS Dysregulation, as measured by the DYS subscale, similar to prior findings in clinical samples. Further research investigating the longer-term associations between BAS Dysregulation with the development of clinically significant bipolar mood symptoms is required.

1. Introduction

A number of psychological factors which confer vulnerability to bipolar affective disorder have been identified. These include hypomanic personality traits [1], self-appraisal biases [2–4], response styles to positive moods [5], and increased reward sensitivity [6]. Whilst numerous studies have investigated the cross-sectional associations between these factors and the risk for developing bipolar disorder in non-clinical samples [e.g., 2,7], few have investigated these relationships over a longer-term follow-up, especially in relation to reward or reinforcement sensitivity. The over-arching goal of the current study was to redress this gap in the research.

Gray's Reinforcement Sensitivity Theory postulates that two motivational neural systems are responsible for co-ordinating behaviour. The first is the Behavioural Activation System (BAS) which is responsible for approach behaviours towards goals and rewards. The second is the Behavioural Inhibition System (BIS)

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which drives inhibitory and avoidance behaviours in response to potential punishments or non-rewards [8,9]. The BAS and BIS systems have since been applied to explain mood symptoms and the vulnerability to bipolar disorder. The increased activation of the BAS has been associated with increased positive affect, heightened reward sensitivity, impulsivity and hypo/manic symptoms [2,9,10]. In contrast, the BIS has been associated with negative affect, avoidance behaviours, depression and a heightened sensitivity towards potential punishments and non-rewards [2,10,11]. Empirical studies have demonstrated that higher self-reported BAS levels are associated with a greater likelihood of and shorter onset to experiencing bipolar disorder over a twelve-month follow-up [12]. High BAS scores are also associated with a higher probability of a lifetime bipolar disorder diagnosis compared to moderate BAS scores [13], and are predictive of a shorter time to the onset of hypo/manic episodes in clinical bipolar samples [14].

The BAS sensitivity approach assumes that individuals who score higher on BAS-related assessments are more prone to mania. However, this offers little explanation for how bipolar-vulnerable individuals with high BAS sensitivity would be predisposed to experiencing depressive states typically associated with low-activation and low BAS levels. BAS dysregulation, considered to be caused by low trait regulatory strength in response to environmental stimuli [15,16], provides an explanation for the experience of instability in mood, behavioural engagement and reward sensitivity for bipolar-prone individuals [17]. Weak regulation of the BAS would mean that vulnerable individuals over-respond to rewarding stimuli, experience prolonged periods of activation leading to heightened manic states, with the opposite patterns for BAS over-deactivation and the experience of depression and low behavioural activity.

To assess individual differences in BAS Dysregulation, Holzwarth and Meyer (2006) developed and validated the Dysregulation of BAS subscale (DYS) [16] based on Carver and White's existing BIS/BAS measure [10]. Holzwarth and Meyer reported higher DYS scores for individuals with probable bipolar disorder compared to low-risk controls, and a lack of an association between DYS and current mood [16]. This latter finding is consistent with the hypothesis that DYS would not be expected to be associated with mean mood levels, but rather with increased variability in mood, energy, motivation and locomotors activation reflecting an underlying behavioural dysregulation [15]. Higher DYS scores have also been found in individuals cognitively at risk for bipolar disorder compared to a control group [18]. There has, however, been a lack of prospective studies investigating the predictive role of BIS/BAS sensitivities, particularly the predictive utility of the DYS scale with the prospective vulnerability to bipolar disorder.

The current study had two aims. As the DYS scale has not been used in any prospective studies to date, the first aim was to investigate whether the self-reported dysregulation of BAS (DYS) was a significant predictor of prospective bipolar disorder vulnerability (MDQ) at a six-month follow-up compared to other BAS measures. Baseline mood symptoms scores, and those on a personality trait-measure of bipolar-vulnerability, were controlled for in the analyses to ensure that the associations between the BAS-related measures and MDQ were independent of current mood and hypomanic personality characteristics commonly associated with bipolar-vulnerability in analogue samples. Second, to explore the specific nature of the behavioural dysregulation associated with bipolar-vulnerability, we investigated the potential interactions between BAS and DYS with BIS in predicting MDQ scores at six-months. Whilst the weak regulation of BAS, as measured by the DYS scale, should be associated with increased bipolar-vulnerability, it may be that bipolar-proneness is better characterised by a combination of heightened BAS and BIS activation rather than higher DYS scores.

2. Method

2.1. Design

This study used a prospective questionnaire-based design. Participants completed measures of mood, personality, BIS/BAS and DYS at baseline and the MDQ at a six-month follow-up. Scores on the BAS and DYS measures were treated as predictor variables with MDQ scores as the outcome variable. BIS was treated as a potential moderator in the analyses.

2.2. Participants

A sample of 127 students (104 females, 23 males; mean age = 24.30 years, SD = 8.04; 35% of the baseline sample) completed baseline and six-month follow-up assessments. Participants were initially recruited on an opportunity basis at baseline and invited, via email, to complete the follow-up measures. Participants who completed the follow-up assessments reported a higher mean age (M_{age} = 24.29 years, SD = 8.05), compared to non-completers (M_{age} = 21.73 years, SD = 4.90), $t(175.926) = -3.291$, $P < .01$ (adjusted alpha = .005). No between-group differences in baseline mood or bipolar-risk measures were found between completers and non-completers.

2.3. Materials

2.3.1. Baseline measures

2.3.1.1. The Behavioural Activation and Inhibition Scales (BIS/BAS). The 28-item version of the BIS/BAS scales, including the 4-item version of the Dysregulation of BAS (DYS) subscale, was used to assess sensitivity of the behavioural activation and inhibition systems, and instability of the BAS [10,16]. The DYS scale has been used in previous analogue studies [18,19] (example DYS item: "*There are times in which I get immediately excited when I see an opportunity for something, while in other periods of time this is not the case at all*"). BAS activity is measured by three subscales, including: BAS Drive, which measures the persistent pursuit of rewards ("*When I want something I usually go all-out to get it*"); Fun Seeking, relating to impulsive novelty seeking, pleasure and a desire for new rewards ("*I will often do things for no other reason than that they might be fun*"); and Reward Responsiveness, measuring responses in anticipation of rewards or after receiving a reward ("*When I get something I want, I feel excited and energised*") [10]. Behavioural Inhibition is measured by a seven-item BIS subscale and captures the anticipation of potential punishments or non-rewards (e.g. "*I worry about making mistakes*") [10]. Participants complete the scales by rating a series of statements relating to each subscale from 1, "Very false for me", to 4, "Very true for me", with scores summed to provide a score for each subscale. The BIS/BAS subscales have demonstrated acceptable-to-good levels of internal reliability (Cronbach αs = .71–.84) [2,16].

2.3.1.2. The Hypomanic Personality Scale (HPS). The 48-item HPS was used to assess hypomanic personality traits, relating to bipolar mood symptoms such as mood lability and increased energy [1]. Participants are required to rate whether each item is a true or false representation of their own personality. The HPS has been demonstrated to be predictive of future bipolar mood symptoms in both at-risk and bipolar samples [20,21]. The HPS has demonstrable high internal consistency (Cronbach α = .89) [7].