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Research paper

Automatic processing of emotional stimuli in euthymic patients with bipolar disorder

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ABSTRACT

Background: Biased information processing styles are a core feature of cognitive models of unipolar depression (UD). The manic-defence hypothesis (MDH) posits that UD and Bipolar Disorder (BD) are subject partially to the same underlying cognitive processes, which may act as putative vulnerability factors. Previous studies have used experimental paradigms as a way of measuring automatic (non-intentional) processing of emotional information in order to test the MDH with some studies providing some evidence for a negatively biased automatic processing of emotionally-relevant information in BD. However, most prior studies used supraliminal stimuli (i.e. presented above perceptual threshold). Based on the MDH we predicted that subliminally presented negative stimuli will affect performance of patients with BD differently than non-clinical participants, but similarly to what has been observed in prior studies with currently depressed patients.

Methods: The current study used an affective priming paradigm with both supraliminally and subliminally presented emotional images as primes to measure automatic processing. Seventeen euthymic individuals with a BD diagnosis were recruited along with seventeen non-clinical control participants (NCC) matched for age and gender.

Results: We found interference (increased response times) due to masked, subliminally presented negative primes in patients with BD when negative prime images were followed by negative targets, but decreased response times (facilitation) in NCCs.

Limitations: We did not include a psychiatric control group and the sample size was small.

Conclusion: Our findings suggest that euthymic patients with BD do exhibit an affective bias suggesting an increased sensitivity to negative emotional information even when euthymic.

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1. Introduction

Bipolar disorders (BD) and unipolar depression (UD) are mood disorders and one of the core questions has always been how similar UD and BD are with respect to vulnerability factors, specifically cognitive processes (e.g. Cuellar et al., 2005; Goodwin and Jamison, 2007). Cognitive models of UD emphasise the role of cognitive processes such as dysfunctional beliefs and information-processing biases (Beck, 1967; Beck et al., 1987; Mathews and MacLeod, 2005). While it makes sense that cognitive processes related to depression are similar in UD and BD, cognitive models do not claim that similar factors and processes necessarily contribute to the development of (hypo-)mania.

The so-called Manic Defence Hypothesis (MDH, Abraham, 1927b), however, posits that depression and mania are subject to the same underlying psychological processes, with mania being an extreme unconscious 'defence' against underlying depression. Neale, (1988a) provided a cognitive-behavioural reformulation. He argued that mania is an attempt to regulate threats to underlying, labile self-esteem and associated mood (Bentall et al., 2006). In order to test this idea Winters and Neale (1985) postulated that explicitly and directly measuring responses to emotional material will elicit 'defensive responding', therefore disguising the truly underlying psychological processes. Indirect measures will 'bypass defensiveness' (Neale, 1988a) capturing automatic responding. Winters and Neale (1985) indeed showed that remitted patients with BD displayed a similar attributional style as UD patients, but only when indirectly measured (for replications: Knowles et al., 2007; Lyon et al., 1999). Additionally, Lyon et al. (1999) found that when explicitly and directly measured currently manic patients endorsed more positive words, but recalled more negative words

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using an autobiographical memory task (for inconsistent findings: Finucane et al., 2013; Fuhr et al., 2014; Van der Gucht et al., 2009). Although it does not mention 'defences', a recent cognitive model proposed that mood swings in BD might be associated with noticing changes in internal states (physiological, emotional or cognitive) which can lead to coping efforts to avoid the feared outcome of mania or depression (Mansell et al., 2007). Perhaps patients with BD notice such changes even on an automatic, preconscious level and initiate efforts to cope with these.

Using the Emotional Stroop Test (EST) some studies showed that vulnerability to BD is related to automatic cognitive processes similar to UD, i.e. longer response times induced by depression-related words (Bentall and Thompson, 1990; French et al., 1996; Lyon et al., 1999) while others did not (Kerr et al., 2005; Lex et al., 2008, 2011). Using the Affective Go/No-go paradigm (AGN) two studies found evidence for a negative response bias in euthymic BD patients (Gopin et al., 2011; Jongen et al., 2007). Others reported a bias towards positive stimuli in currently manic patients (Murphy et al., 1999) or following a positive mood induction (Roiser et al., 2009).

It is important to note that all experimental paradigms used in the research above allow conscious processing of the emotionally-relevant information, i.e. those paradigms do not fulfil a major component of automaticity in the form of unconscious processing (Teachman et al., 2012). With respect to BD the question is whether subliminal presentation of emotional stimuli, especially of negative valence, will affect the behaviour of patients with BD (Abraham, 1927b; Neale, 1988a). Using an Affective Priming Paradigm (APP) Murphy and Zajonc (1993) demonstrated in a non-clinical sample that subliminal presentation of emotionally-valent primes (facial expressions) significantly influenced the preference for emotionally-neutral targets while supraliminal primes did not. They argue that at supraliminal exposures participants consciously access additional information for more extensive cognitive appraisal, which can alter the primary automatic reaction and mask biased processing occurring at the pre-cognitive appraisal level (see also Hermans et al., 2003). Dannlowski et al. (2006) also used an APP in a sample with UD but the targets were emotionally-valent as well. In addition, they used the known effects of congruence and incongruency to investigate their hypotheses. Congruence in content or emotional valence leads to faster response times to the target, while interference or longer reaction times is observed for incongruent pairs (e.g. Fazio, 1986; Hermans et al., 2003). Dannlowski et al. (2006) found increased interference following subliminal presentation of negative primes in individuals with UD regardless of the valence of the target, providing some evidence for an automatic appraisal bias in the processing of negative emotional information. Kim et al. (2011) used faces as primes and found that subliminally presented sad faces affected the ratings of pleasantness of target stimuli, i.e. neutral faces, in both euthymic patients with BD and healthy controls. However, when the faces were presented supraliminally, only patients with BD still showed a negativity bias in their judgements. Kim et al. (2011) therefore concluded that automatic processing in BD is intact but controlled processing of emotional stimuli is impaired which would contradict the MDH.

The aim of this study was to investigate automatic processing of emotionally-relevant information in individuals with BD. We used the APP with primes presented above and below perceptual threshold to examine if the differences in processing of negative emotional stimuli in BD patients are specific to automatic processing. Only currently euthymic participants were selected to examine trait-like emotional processing biases in BD independent of mood episodes. While Dannlowski et al. (2006) used words as primes, images have been chosen for the present study due to their more rapid activation of meaning (Hermans et al., 2003; Schacht and Sommer, 2009). Contrary to Kim et al. (2011) we did not restrict the primes to faces, i.e. interpersonally relevant stimuli, to capture a wider range of emotionally relevant stimuli.

The very few existing studies do not allow for clear hypotheses because they differ in various factors including samples, chosen stimuli and ways of assessing automatic processing. However, based on the MDH, we hypothesized that euthymic patients with BD will show interference for congruent negative-negative prime-target pairs, while non-clinical participants will show the expected faster RTs compared to baseline, i.e. facilitation. However, we anticipated that the postulated effect will be specific to subliminally presented primes (for review: Klauer et al., 2003). Instead of relying on ratings of pleasantness of stimuli, we chose reaction times to a correct classification of the target words as being 'positive' or 'negative'.

A secondary, exploratory hypothesis refers to processing of positive emotionally-relevant information, i.e. the possibility of a positive bias in BD. While this has so far only been shown for supraliminally presented stimuli in BD and was not evident in the pleasantness ratings in Kim et al. (2011) study, it is possible that subliminal presentation of positive primes will result in a similar pattern of facilitation for the congruent positive-positive prime-target pairs in both BD individuals and non-clinical participants as would be expected in the general affective priming literature (e.g. Fazio, 1986). However, when the primes are consciously processed, facilitation will disappear for non-clinical participants, but might still be evident for the BD group due to a preferential processing of positive information demonstrated in some studies (e.g. Gruber et al., 2011; Murphy et al., 1999; Roiser et al., 2009).

2. Material and methods

We approached a pool of n=63 patients from a regional specialist affective disorder service (RADS). Twenty-four did not respond to the invitation, while a further 18 either declined or did not attend any of two consecutively scheduled testing sessions. Twenty-one patients were tested but four were excluded because of a current mood episode, i.e. final n=17 (7 female; n=10 BD-I, n=7 BD-II). Inclusion criteria were a) confirmed diagnosis of BD, b) having had experienced a mood episode in the last 5 years but not in the 8 weeks preceding testing (Frank et al., 1991), c) age between 18–65; Exclusion criteria were: a) current rapid cycling, i.e. more than four episodes of mania or depression with less than 1 month apart in the past year; b) significant self-rated subsyndromal depressive symptoms (Q-IDS score $\geq$ 11), c) current substance misuse; d) medical conditions that could impair cognitive or motor functioning; e) clinical evidence of a borderline or antisocial personality disorder (referring clinicians were instructed about this); f) visual impairment not corrected by glasses or contact lenses; g) first language other than English. All referred patients were on mood stabilising medication at that time.

Non-clinical control participants (NCCs) were recruited from the IoN research volunteer data base (Newcastle University) and advertisements. NCCs were matched to patients for age, gender and education. The same exclusion criteria applied for the NCCs. Additionally NCCs were not allowed to have a lifetime history of a mental health problem and no family history of affective disorder. 25 participants were contacted. No response was received from seven individuals. One person was excluded as their first language was not English.

2.1. Measures

2.1.1. Structured Clinical Interview for DSM-IV (SCID-I) (First, Spitzer, 1989)

The SCID-I was used to confirm inclusion/exclusion criteria.

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