Biological Psychology 127 (2017) 82–88

Contents lists available at ScienceDirect

Biological Psychology

journal homepage: www.elsevier.com/locate/biopsycho

Inhibitory Control for Emotional and Neutral Scenes in Competition: An Eye-Tracking Study in Bipolar Disorder

Ana García-Blanco[a,b,*], Ladislao Salmerón[c], Manuel Perea[c,d]

[a] Health Research Institute La Fe, Valencia, Spain
[b] Department of Personality, Evaluation, and Psychological Treatment, University of Valencia, Valencia, Spain
[c] ERI-Lectura, University of Valencia, Valencia, Spain
[d] Basque Center on Cognition, Brain, and Language, San Sebastián, Spain

ARTICLE INFO

Keywords:
Emotional processing
Mood-congruent biases
Attention
Inhibitory control
Bipolar disorder

ABSTRACT

This study examined the inhibitory control of attention to social scenes in manic, depressive, and euthymic episodes of bipolar disorder (BD). Two scenes were simultaneously presented (happy/threatening/neutral [target] versus control). Participants were asked either to look at the emotional pictures (i.e., attend-to-emotional block) or to avoid looking at the emotional pictures (i.e., attend-to-neutral block) while their eye movements were recorded. The initial orienting (latency and percentage of first fixation) and subsequent attentional engagement (gaze duration) were computed. Manic patients showed a higher percentage of initial fixations on happy scenes than on the other scenes, regardless of the instructions. However, in the attend-to-neutral block, their gaze durations were longest for threatening scenes. Inhibitory control was not modulated by the scene's emotional salience in the other groups. Thus, manic patients had difficulties voluntarily ignoring emotional information – this was characterized by a happy-related bias during initial orienting, but a threat-related bias during attentional engagement.

Bipolar disorder (BD) is a mood disorder characterized by episodes of abnormal, persistent high mood (mania) and, at times, low mood (depression), together with remission episodes (euthymia) (Goodwin and Jamison, 2007). While the last publication of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013) includes mood dysregulation as a new clinical entity for BD, the underpinnings of how mood dysregulation occurs in BD is still under discussion (Brotman et al., 2007).

To understand what emotion dysregulation entails in BD, it is fundamental to assess whether individuals are able to voluntarily control emotional responses in terms of directing attention to emotionally relevant stimuli (Gratz and Roemer, 2004; Phillips, Ladouceur, & Drevets, 2008). In this experiment, we do so by simultaneously presenting two images (i.e., target [happy, threatening, or neutral] versus control [neutral]) to which BD patients in their different episodes (mania, depression, and euthymia) have to respond according to specific instructions (i.e., pay attention *only* to the emotional picture versus pay attention *only* to the neutral picture) while their eye movements are recorded – note that the recording of the participants' eye movements is an excellent procedure to assess the temporal (duration) and spatial (location) measures of attentional capture (see Rayner, 2009, for a review on cognitive processes and eye movements).

Recent eye-tracking research in our laboratory has examined how the inhibitory control of attention is captured by emotional stimuli as a function of the BD patients' mood (e.g., García-Blanco, Perea, & Salmerón, 2013). Specifically, García-Blanco, Perea, & Salmerón (2013) conducted an emotional antisaccade experiment with happy, sad, and neutral faces in BD patients (during mania, depression, and euthymia episodes). A group of healthy individuals served as controls. Participants had to inhibit the automatic prosaccade and voluntarily generate an antisaccade to the opposite location. Results showed that manic and depressed BD patients committed more antisaccade errors than control individuals – this difference was absent in euthymic BD patients. Importantly, manic BD patients committed more antisaccade errors with happy faces, whereas depressed BD patients showed a non-significant trend to commit more antisaccade errors with sad faces. Neither euthymic BD patients nor control individuals showed differences across conditions. García-Blanco et al. (2013) concluded that BD patients had an impaired ability to inhibit their attentional orienting toward mood-congruent stimuli during abnormal mood states, especially during manic episodes. This pattern provides some support to the Beck's Cognitive Model (1976) for BD: negative schemata would characterize depression and positive schemata would

* Corresponding author at: Health Research Institute La Fe, Av. Fernando Abril Martorell, 106, 46010 Valencia, Spain. Tel.: +34 961245553.
E-mail address: ana.garcia-blanco@uv.es (A. García-Blanco).

http://dx.doi.org/10.1016/j.biopsycho.2017.05.006
Received 4 November 2016; Received in revised form 5 May 2017; Accepted 6 May 2017
Available online 10 May 2017
0301-0511/

characterize mania.

Clearly, antisaccade tasks offer valuable information with respect to the initial orienting of attention. However, in addition to initial orienting, attentional capture involves other attentional processes such as the engagement of attention paid to a particular image when looking at it for the first time before looking away from it (Posner and Petersen, 1990). Another potential limitation of the García-Blanco et al. (2013) experiment is that they only used happy and sad images as emotional stimuli. Freeman, Garety, Kuipers, Fowler, and Bebbington (2002) showed that BD patients have difficulties ignoring threatening stimuli. Indeed, threat-related schemata may underline psychotic states and paranoid traits in BD, especially during manic episodes (Mansell, Morrison, Reid, Lowens, & Tai, 2007). To overcome these difficulties, García-Blanco, Salmerón, & Perea (2015) simultaneously displayed a target scene (happy, threatening, neutral) and a neutral control scene for 3 s in a free-viewing task with BD patients – a group of healthy individuals was included as a control. Participants' initial orienting of gaze (i.e., the location of the first fixation) was directed more frequently toward emotional images (both happy and threatening) than toward neutral images in all groups. However, unlike healthy individuals, BD patients (regardless of their episode) showed greater attentional engagement (i.e., sum of fixation durations before leaving the item [gaze duration]) to threatening scenes relative to neutral ones (see also García-Blanco, Salmerón, Perea, & Livianos, 2014, for similar evidence in a free viewing task with four simultaneously presented images). This threat-related bias is consistent with the idea that threat-related information is highly salient in BD (Freeman, Garety, Kuipers, Fowler, & Bebbington, 2002). Importantly, these biases occurred during attentional engagement but not during initial orienting.

Of particular interest here is examining whether BD patients can modify their attentional biases and ignore distracting information that attracts attention. The idea is that a deficit to control attention that overrides voluntarily dominant responses may induce abnormal emotional reactions that entail difficulties in emotional self-regulation. However, free-viewing tasks such as the task used by García-Blanco et al. (2015) do not provide a measure of inhibitory control of attention per se. In the present experiment, we modified the instructions given in the García-Blanco et al. (2015) experiment so that we could directly obtain a direct measure of inhibitory control: in one block, participants were instructed to *only* attend to the emotional image, whereas in the other block participants were instructed to *only* attend to the neutral image (Nummenmaa, Hyönä, & Calvo, 2006, for a similar procedure with healthy individuals). To be able to look at only one of the two images, participants need to: (i) recognize the correct scene by means of peripheral vision; (ii) fixate on this scene; and (iii) keep fixating on this scene until the completion of the trial. As healthy individuals in free-viewing tasks tend to orient their attention more frequently toward emotional images than neutral ones (Nummenmaa, Hyönä, & Calvo, 2006), the attend-to-neutral block involves a controlled inhibition: participants are required to inhibit the automatic response to emotional images and voluntarily direct their gaze to neutral pictures. With healthy individuals in the attend-to-neutral block, Nummenmaa et al. (2006) found that the percent of first fixations was higher and the gaze duration was longer for emotional than for neutral images – this pattern was not modulated by stimulus valence (happy versus threatening). That is, in attend-to-neutral blocks, healthy individuals have difficulty in ignoring emotional information in terms of both initial orienting (i.e., emotional images received a higher percent of first fixations than neutral images) and attentional engagement (i.e., emotional images received longer gaze durations than neutral images).

To sum up, the main goal of the present experiment was to examine inhibitory control across the three BD states (manic, euthymic, depressed) as a function of the type of target scene (happy, threatening, and neutral). The two main research questions were: (i) whether manic BD individuals would show higher deficit in inhibitory control for happy pictures than for neutral or threatening images (i.e., a mood-congruent bias), as Beck's (1976) theory would predict or (ii) whether BD individuals – regardless of their episode – would show higher deficit in inhibitory control for threatening images than for happy and neutral ones (i.e., a bias toward threatening information), as Freeman et al.'s (2002) cognitive model would predict). To shed some light on these two questions, we examined two attentional components (see also Nummenmaa et al., 2006, for a similar approach): (1) initial orienting of attentional capture (i.e., the latency of the first fixation and the percentage of the first fixation); and (2) attentional engagement (i.e., the gaze duration).

1. Method

1.1. Participants

Eighty-four BD patients from the Psychiatry Department at the "La Fe" University and Polytechnic Hospital (Valencia, Spain) and 27 healthy individuals recruited through advertising in the community took part in the experiment. Patients fulfilled the DSM-IV-TR criteria for BD and were included in the manic (n = 29), depressed (n = 27), or euthymic (n = 28) group at the time of assessment. BD patients were recruited from inpatient wards (n = 40) and from Bipolar Disorders Unit for outpatients (n = 44). Four patients in manic episodes refused to cooperate. The ethics committee of the "La Fe" Health Research Institute authorized this study. Demographic and clinical details are presented in Table 1.

No participant showed difficulty in obtaining stable eye tracking (e.g., eye diseases, interference from glasses, or frequent crying) or major medical disorders, neurological history, or use of non-psychotropic medication that could influence cognition (e.g., treatment with corticosteroids). No healthy control reported any kind of psychiatric history. Additional exclusion criteria for patients were (i) other psychiatric diagnoses based on the DSM-IV-TR criteria (American Psychiatric Association [APA], 2000) and (ii) having received electroconvulsive therapy within the previous 3 months. All patients were referred by psychiatrists in the Bipolar Disorders Unit who diagnosed the BD patients following the DSM-IV-TR criteria. The responsible psychiatrist together with a postgraduate clinical psychology intern corroborated the BD diagnosis via a clinical interview and case note review. Every BD patient had to present at least one manic episode. The Young Mania Rating Scale (YMRS; Young, Biggs, Ziegler, & Meyer, 1978) and the Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996) were used to control the presence of affective symptoms in healthy participants and in euthymic patients and to exclude mixed states (BDI-II scores < 9, except in the depressed

Table 1
Demographic and clinical data from control group, depressed, euthymic, and manic patients. Data shown are averages and standard deviations.

	Control (N = 27)	Euthymic (N = 28)	Depressed (N = 27)	Manic (N = 29)	p value
% Female	48.1	39.3	44.4	44.8	0.93
Age	42.0 (12.6)	41.1 (10.3)	49.4 (9.8)	44.4 (12.0)	0.05
SASS	43.8 (6.0)	40.1 (5.3)	40.8 (6.8)	39.5 (6.2)	0.07
No. of episodes	–	6.1 (5.3)	7.6 (4.5)	7.1 (5.6)	0.56
BAI	11.2 (7.0)	6.3 (5.0)	24.9 (90)	11.5 (7.3)	**0.000**
BDI	5.9 (6.0)	3.4 (41)	25.8 (7.9)	5.1 (3.6)	**0.000**
YMRS	–	1.2 (2.2)	1.8 (2.4)	23.7 (5.5)	**0.000**
Medication (% of patients)					
Lithium (%)	–	89.3	70.4	72.4	0.18
Antiepileptic	–	46.4	66.7	41.4	0.14
Antipsychotic	–	39.3	48.1	96.6	**0.000**
Antidepressive	–	7.1	55.6	6.9	**0.000**
Anxiolytic	–	42.9	81.5	89.7	**0.000**

Note: The p-values correspond to the omnibus test for all groups. Bold values indicate significant differences between groups.