

BRIEF COMMUNICATION

Deficits in recognition, identification, and discrimination of facial emotions in patients with bipolar disorder

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Objective: To analyze the recognition, identification, and discrimination of facial emotions in a sample of outpatients with bipolar disorder (BD).

Methods: Forty-four outpatients with diagnosis of BD and 48 matched control subjects were selected. Both groups were assessed with tests for recognition (Emotion Recognition-40 – ER40), identification (Facial Emotion Identification Test – FEIT), and discrimination (Facial Emotion Discrimination Test – FEDT) of facial emotions, as well as a theory of mind (ToM) verbal test (Hinting Task). Differences between groups were analyzed, controlling the influence of mild depressive and manic symptoms.

Results: Patients with BD scored significantly lower than controls on recognition (ER40), identification (FEIT), and discrimination (FEDT) of emotions. Regarding the verbal measure of ToM, a lower score was also observed in patients compared to controls. Patients with mild syndromal depressive symptoms obtained outcomes similar to patients in euthymia. A significant correlation between FEDT scores and global functioning (measured by the Functioning Assessment Short Test, FAST) was found.

Conclusions: These results suggest that, even in euthymia, patients with BD experience deficits in recognition, identification, and discrimination of facial emotions, with potential functional implications.

Keywords: Social cognition; bipolar disorder; impairment; face emotion recognition; emotion processing

Introduction

Social cognition is the cognitive ability to infer the mental states of others in terms of thought, emotion, and intention, which makes it possible to predict the behavior of others and to understand the social information of one's surroundings. In the last decade, several authors have reported social cognition deficits in patients with bipolar disorder (BD) both in euthymia¹⁻³ and during relapses.⁴ A recent meta-analysis⁵ showed that euthymic patients with BD exhibit a significant deficit in theory of mind (ToM), with a medium-large effect size ($d = 0.79$). However, the deficit in facial emotion recognition appears minor ($d = 0.35$) and there is controversy as to whether BD patients are worse at identifying certain emotional expressions or whether they present a global deficit.⁶ Despite several published studies about recognition and identification of emotions in BD,⁷ discrimination of emotions has yet to be explored.

Social cognition – and specially emotion recognition – has been proposed as an endophenotype of BD, given that it may be observed even in first-degree relatives⁸ and

subjects at high risk.⁹ Several neuroimaging studies have explored the neural correlates of this trait deficit of emotion recognition in BD.¹⁰⁻¹³ Despite some mixed findings, they overall propose an abnormally increased activity in subcortical and limbic emotion processing regions (e.g., the amygdala) and reduced responses in prefrontal cortical emotion regulation regions (see reviews).^{14,15}

The main goal of this study is to analyze the recognition, identification, and discrimination of facial emotions in a group of outpatients with BD compared with a control sample of healthy subjects.

Methods

The sample included a total of 92 participants. Forty-four outpatients fulfilling DSM-IV-TR criteria for BD were recruited. Forty-eight healthy control subjects without psychiatric or neurologic disorders were also recruited and matched for sex, age, and educational level with the experimental sample. Exclusion criteria were any other psychiatric disorder (axis 1), mental retardation ($IQ < 70$), organic brain damage, substance abuse/dependence (except nicotine or caffeine dependence), deafness, and difficulties in understanding Spanish. In the outpatient group, 39 met criteria for bipolar I disorder and five for bipolar II disorder. All patients had been stable

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(episode-free) for the last 3 months and under outpatient follow-up for at least the 12 previous months. All subjects gave written informed consent to participate in this study. Ethical approval for the study was granted by the Ethics Committee of Hospital Universitario Príncipe de Asturias.

Instruments

The ability to recognize emotion expressions was evaluated in both groups using the following three tasks: 1) the Facial Emotion Identification Test (FEIT)⁸⁻¹⁶ shows 19 black and white pictures of six basic emotions (happy, sad, anger, surprise, disgust, and shame) which the participant must identify; 2) the Facial Emotion Discrimination Test (FEDT)⁸⁻¹⁶ comprises 30 pairs of black and white pictures with faces presented concurrently. This test requires the participant to determine whether the two faces in each pair of pictures are displaying the same or different emotions; and 3) Emotion Recognition-40 (ER40).⁹⁻¹⁷ This test shows 40 pictures in which participants have to identify the displayed emotion. There are five options: anger, sad, fear, happy, and no emotion. The score range is between 0 and 40.

Additionally, the Spanish version of the Hinting Task was applied. This test consists of 10 brief stories that describe interactions ending in a hint; the individual has to derive the content of said hint.¹⁰⁻¹⁸

Clinical features included in the study were the following: number and type of episodes, duration of illness, previous psychotic symptoms, number of hospitalizations, and type of BD (I or II). The presence of depressive symptoms was assessed with the Spanish version of the Hamilton Depression Rating Scale (HDRS) and manic symptoms with the Young Mania Rating Scale (YMRS). Euthymia was defined as HDRS \leq 8 and YMRS

\leq 6. Global functioning was assessed with the Functioning Assessment Short Test (FAST) scale.

Statistical analysis

Student's *t* test and analysis of variance (ANOVA) were used for continuous variables with more than 30 cases and a normal distribution (as calculated by the Kolmogorov-Smirnov test). Nonparametric tests (Mann-Whitney *U* and Kruskal-Wallis test) were used for variables that were not normally distributed in the studied population. The relationship between recognition, identification, and discrimination of facial emotions with clinical measures was explored using Pearson correlation coefficients. A MANCOVA analysis was conducted with the clinical measures as possible explanatory variables and performance on emotion recognition as the dependent variable. P-values were considered significant if $p \leq 0.05$.

Results

Both groups showed similar sociodemographic characteristics (sex, age, and educational level) (Table 1).

The normal distribution of social cognition measures was assessed by the Kolmogorov-Smirnov test. FEIT, FEDT, and ER40 were distributed normally. However, the Hinting Task was not, showing a marked ceiling effect.

On between-group comparison of facial emotions recognition scores, patients with BD scored lower than controls in recognition (ER40), identification (FEIT), and discrimination (FEDT) of emotions (*t* test; $p < 0.05$ for all three scores, see Table 1). In addition, a lower score in the Hinting Task was also found in BD patients compared to the control group.

Table 1 Sociodemographic, clinical features, and performance in emotion recognition and theory of mind tasks

	Patients	Controls	<i>t</i> test/chi-square	p-value
Age, mean (SD)	42.3 (11)	45.73 (12.2)	-1.38	0.171
Female (%)	63.6	62.5	0.044	0.834
Education level, n (%)			4.162	0.197
Primary	23 (52.3)	15 (31.3)	3.08	0.214
Secondary	12 (27.3)	17 (35.4)		
University	9 (18.8)	16 (33.3)		
Marital status, n (%)			3.550	0.169
Single	20 (45.5)	17 (35.4)		
Married	17 (38.6)	27 (56.8)		
Divorced	7 (15.9)	4 (8.3)		
Widowed	1 (2.08)	0 (0)		
Years of illness, mean (SD)	13.98 (8.13)			
No. previous hospitalizations, mean (SD)	2.65 (2.21)			
No. episodes, mean (SD)	6.75 (3.26)			
YMRS	4.58 (4.04)			
HDRS	7.13 (7.04)			
FAST	38.74 (16.32)	5.42 (3.55)	12.951	0.000
FEIT	7.89 (3.86)	12.75 (4.57)	-5.980	0.000
ER40	26.61 (6.11)	31.38 (3.70)	-4.909	0.000
FEDT	23.86 (3.67)	26.33 (2.99)	-3.925	0.000
Hinting Task	16.79 (3.36)	18.24 (1.88)	-2.345	0.022

ER40 = Emotion Recognition-40; FAST = Functioning Assessment Short Test; FEDT = Facial Emotion Discrimination Test; FEIT = Facial Emotion Identification Test; HDRS = Hamilton Depression Rating Scale; SD = standard deviation; YMRS = Young Mania Rating Scale.

The social cognitive performance of patients with BD type I and II was similar, with no significant differences in ER40 (t test; $p = 0.86$), FEIT ($p = 0.108$), FEDT ($p = 0.370$), or Hinting Task ($p = 0.826$) scores.

To establish the relationship between facial emotion recognition and the presence of mild syndromal symptoms, the BD group was subdivided according to the HDRS and YMRS scores. The performance of patients with HDRS ≤ 7 (euthymia; $n=24$) and HDRS ≥ 8 (syndromal symptoms; $n=20$) was compared. There were no significant differences between the euthymia and depressive subgroups in the FEIT, FEDT, and ER40 tests. The same procedure was carried out with manic symptoms. The performance of patients with YMRS ≤ 7 (euthymia; $n=36$) and YMRS ≥ 8 (syndromal symptoms; $n=8$) was compared, and again, there were no significant differences between the euthymia and mania subgroups in the FEIT, FEDT, and ER40 tests.

A complementary analysis was performed. We compared the social cognition performance of the 24 BD patients who met restrictive criteria for euthymia (HDRS and YMRS ≤ 7) with that of the healthy controls. As in the main analysis, patients with BD scored significantly lower than controls on recognition (ER40; $p = 0.001$), identification (FEIT; $p = 0.000$), and discrimination (FEDT; $p = 0.002$) of emotions.

Among patients with BD type I and BD type II, no association was found between emotion recognition, identification, and discrimination measures and clinical variables such as duration of illness, number of previous manic/hypomanic or depressive episodes, history of psychosis, and subclinical symptoms assessed by the YMRS and HDRS ($p > 0.05$ for all comparisons). A MANCOVA analysis found the only significant difference to result from the presence of illness ($p < 0.005$). There was no significant dependence on sex ($p = 0.345$), age ($p = 0.383$), number of episodes ($p = 0.123$), duration of illness ($p = 0.108$), depressive symptoms ($p = 0.567$), or manic symptoms ($p = 0.179$).

Regarding the link between social cognition measures and global functioning, a significant correlation was observed between FEDT scores (emotional discrimination) and FAST scores (functioning) ($r = -0.324$; $p = 0.03$). The other measures of interest (ER40, FEIT, Hinting Task) did not correlate significantly with functioning.

Discussion

The main finding of this study is the presence of deficits in recognition, identification, and discrimination of facial emotions in patients with BD in the inter-episode phase, whereas healthy controls did not exhibit any such deficits.

This finding is consistent with other studies that have reported an overall deficit in the identification of basic emotions in euthymic patients with BD^{19,20} and partially corroborates those which have found deficits in facial identification of fear²¹ or disgust and happiness.²² On the other hand, the present work disagrees with previous studies that reject the existence of this deficit, although it should be taken into account that the small sample sizes

of some of these studies (e.g., $n=17$,²³ $n=21$ ²⁴), reduces statistical power and, consequently, the possibility of capturing small and medium effect sizes, as is the case.

Patients with BD type II and those with BD type I showed similar emotional recognition deficits. Few studies have compared social cognition between these groups. The present study reinforces the finding that social cognition and functioning deficits in BD type II are no less severe than in BD type I and, therefore, should not be minimized.²⁵

This study included a broad sample of patients, restrictive criteria for euthymia, patients with BD type I and II, and measures of different aspects of emotional recognition. However, it has several limitations that should be taken into account when interpreting its results: 1) the potential interference of psychotropic drugs on the performance of the tests, as all patients were on pharmacological treatment²⁶; 2) a complete neuropsychological assessment was not carried out. In this regard, Martino et al.²⁷ have noted the potential relevance of attentional and executive functions in emotional processing of BD patients; 3) finally, hits and errors were not registered for each particular emotion; instead, an overall score was calculated. This made it impossible to ascertain whether any specific emotion is recognized with higher difficulty. Goghari & Sponheim²⁸ recently reported that bipolar patients were more likely to mislabel facial expressions of anger as fear. Although the meta-analysis of Samamé et al.⁵ did not find significant differences for any of the six basic emotions, a high level of heterogeneity was reported in the effect size distributions for fear and disgust. This issue should be addressed in future research. Definitely, another target for future investigation should be assessment of the neural correlates of facial emotion processing in BD, whether through event-related potential studies^{29,30} or functional neuroimaging.^{31,32}

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Disclosure

The authors report no conflicts of interest.

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