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Hostile attributions in bipolar disorder and schizophrenia contribute to poor social functioning

Lahera G, Herrera S, Reinares M, Benito A, Rullas M, González-Cases J, Vieta E. Hostile attributions in bipolar disorder and schizophrenia contribute to poor social functioning.

Objective: To compare the profile of attributional style of a group of out-patients with bipolar disorder (BD) and schizophrenia (SZ), and a group of healthy controls – along with other social cognition domains – such as emotion recognition and theory of mind (ToM).
Method: A total of 46 out-patients diagnosed with BD, 49 with SZ, and 50 healthy controls were assessed in attributional style (Ambiguous Intentions Hostility Questionnaire), facial emotion recognition (FEIT, FEDT, ER-40), and ToM (Hinting Task). Symptomatology, clinical variables and global functioning were also collected.
Results: Both groups with SZ and BD showed hostile social cognitive biases, compared with the control group. Patients with BD also showed a capacity for emotional recognition similar to those with SZ and worse than control subjects. In contrast, patients with SZ showed poorer ToM. Subthreshold depressive symptoms and an attributional style toward hostility appeared as the factors with a strongest association to global functioning in BD. In SZ, PANSS score and a tendency to aggressiveness were the most relevant factors.
Conclusion: Attributional style (along with other domains of social cognition) is altered in out-patients with BD and SZ. The presence of residual symptoms and a hostile social cognitive bias may contribute to the functional impairment of both groups.

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Key words: social cognition; theory of mind; emotion recognition; subthreshold symptoms; bipolar disorder; schizophrenia

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Significant outcomes

- Attributional style (AS) is a key domain of social cognition that identifies the tendency to attribute negative events to others. The Ambiguous Intentions and Hostility Questionnaire was used to assess it in out-patients with bipolar disorder (BD), schizophrenia (SZ), and controls.
- Bipolar patients with residual symptomatology showed a social cognitive bias toward hostility, intention, anger, and aggressiveness, similarly to patients with SZ. Specifically, depressive symptoms in BD were positively correlated with attributional style, and both contributed to the global functioning impairment.
- Our results outlined the relevance of subthreshold symptoms as a contributor of functional impairment in BD. Social cognition – and specially attributional style – appears as a potential mediator between these affective symptoms and functioning.

Limitations

- Lack of a full neuropsychological evaluation.
- All patients were receiving psychotropic medication.
- In emotion recognition tasks, scores in each particular emotion were not collected. This has prevented us to discern if any specific emotion is recognized with more difficulty.

Introduction

Social cognition has been defined as 'the set of cognitive processes involved in how people think about themselves, other people, social situations, and interactions' (1, 2). It is therefore the ability to perceive, process, and interpret social cues, which allows us to infer the mental states of others (3). The NIMH consensus statement identified four core domains of social cognition – emotion processing, social perception, theory of mind/mental state attribution (ToM), and attributional style/bias (4). However, research in this field has been disproportionately focused on ToM compared with the other domains.

A number of studies with patients with schizophrenia (SZ) have found a deficit in tasks requiring ToM or inference of others' mental states (5–7), which seems relatively independent of general cognitive deficits (8, 9). Other studies have also shown that patients with SZ have a deficit of emotion recognition (10–12) with an effect size of -0.70, considered moderate–severe deficit (13). It appears to be stable throughout the different phases of the illness (14, 15). A recent meta-analysis examined differences between patients with SZ and controls across all multiple domains of social cognition. Results showed a deficit in SZ in social perception, emotion recognition, and ToM, but findings in attributional style are controversial. Despite there was some evidence that some specific bias were associated with paranoid traits in people across both samples, no significant differences were found between SZ and controls (16).

Attributional style (AS) is considered a key domain of SC, but has so far been little studied. It reflects whether one typically makes inferences about the causes of positive and negative events to internal (personal), external (other person), or situational factors (16). Prototypical tasks used to assess AS are the Internal, Personal, and Situational Attributions Questionnaire (IPSAQ; 17) and the Ambiguous Intentions and Hostility Questionnaire (AIHQ; 18). These tasks are designed to evaluate hostile social cognitive biases and to identify the tendency to attribute negative events to others rather than to situational factors. In the case of SZ, some studies have found an externalizing bias, by which the causality of negative events tends to be attributed to others (19). Currently, paranoid patients tend to use more external-personal attributions in negative events than non-paranoid and healthy controls (20). A recent factor analysis also showed that positive symptoms and agitation are also associated with a 'hostile attributional style' (a tendency to overattribute hostile intentions to others and to respond to others in a hostile manner) among SZ (21). However, findings are mixed and there is no clear evidence that supports the existence of this bias in SZ (22–24).

The number of studies on social cognition in patients with bipolar disorder (BD) is scarcer than SZ, although progressively growing. Several authors have found a deficit of social cognition in BD in both acute and euthymic patients (25–29). A recent meta-analysis (30) found that patients in euthymic phase have a significant deficit of ToM, with a medium to large effect size ($d = 0.79$). However, the deficit in facial emotion recognition appears clearly smaller ($d = 0.35$). Regarding bias in attributional style, a tendency to generate pessimistic attributions (internal, stable, and global) for negative events has been found in depressed patients (31), which may be an indirect indicator of low self-esteem and low mood (32, 33). A pessimistic attributional style in patients with remitted (33) and currently symptomatic BD has also been shown (34), as well as an association between different self-referential thinking processes and different phases of BD (35). Lahera et al. (36) found that bipolar out-patients showed an intention social cognitive bias (a higher tendency to attribute intentions to ambiguous scenes) and an anger bias (a tendency to become angry in these situations). However, studies of attributional style in BD – and comparisons with SZ – are still scant, despite its potentially relevant link with psychosocial functioning.

Studies comparing social cognition in SZ and BD show a more pronounced deficit in emotional processing in patients with SZ (37–39). Conversely, Lee et al. (40) found that patients with BD appeared similar to controls and both groups performed better than patients with SZ. A recent study by Yalcin-Siedentopf et al. (41) showed a deficit in emotion recognition in both patients with SZ and BD, although more pronounced in SZ and more dependent on residual symptoms in BD.

In summary, studies have shown an impairment of social cognition in SZ and BD. However, the results are partially discrepant and comparative studies with large samples, assessment of different SC domains and control group are lacking. Specially the dimension of social cognition 'attributional style' has been poorly studied and may be relevant in the phenotypic differentiation of both disorders. The potential influence of affective symptomatology on this dimension is also an open question in both disorders.

Aims of the study

The main objective of this study was to compare the attributional style of a group of out-patients with bipolar disorder and schizophrenia, and a group of healthy controls. Our hypothesis was that patients with bipolar disorder and schizophrenia would both show a different attributional style compared with the control group and each group would show a specific profile (with a higher degree of Hostility and Intentionality bias in schizophrenia and Anger bias in bipolar disorder). A second objective of the study was to compare the performance of patients and controls in other social cognition domains, such as emotion recognition and theory of mind. According to previous literature, we hypothesized that both patient groups would be impaired compared with controls, but patients with schizophrenia would show more reduced performance in these tasks. Finally, a third objective was to analyze the differential impact of these three social cognition components on the overall functioning of patients with schizophrenia and bipolar disorder. We hypothesized that there would be a relationship between hostile attributions and general functioning, influenced by clinical symptomatology.

Material and methods

Participants

The total sample consisted of 145 participants. Of these, 46 were out-patients diagnosed with BD and 49 were out-patients diagnosed with SZ according to DSM-IV TR criteria (42). Both groups of patients were enrolled in the out-clinic – and without criteria for clinical relapse – for at least 12 months prior to the investigation and were on pharmacological treatment. The control group consisted of 50 participants with no psychiatric or neurological disease, with similar sociodemographic characteristics (sex, age, and educational level) to case groups. The study exclusion criteria were mental retardation (considered as IQ <70), brain damage, difficulties in understanding Spanish, and comorbidity with other psychiatric disorders except caffeine or nicotine dependence. Part of the sample (37 patients with BD and 32 healthy controls) had participated in previous works from our group (36, 43). All participants gave written informed consent.

Instruments

The attribution of intentions was measured through the AIHQ (18). It is comprised of a variety of negative situations that differ in terms of intentionality. Items were developed to reflect causes that were ambiguous, intentional, and accidental in nature. The participant must indicate why he/she thinks the protagonist acts this way (AIHQ-HB subscale, Hostility Bias), if he/she thinks the character did it on purpose (AIHQ-IS subscale, Intentionality Bias) and how much to blame the character of the story is (AIHQ-BS subscale, Blame Scale). Likewise, he/she has to rate how much angriness would experience in that situation (AIHQ-AS subscale, Anger Bias) and what would he/she do in that situation (AIHQ-AB subscale, Aggressivity Bias). Higher scores reflect a more hostile, negative and personal attributional style, and more aggressive attributions.

Facial emotion recognition was assessed through the Facial Emotion and Identification Test (FEIT; 44), the Facial Emotion Discrimination Test (FEDT; 44), and the Penn Emotion Recognition-40 (ER-40; 45). In all of them, a set of photographs of faces expressing different emotions is presented:

i) The FEIT includes 19 photographs that show each one of the six basic emotions (happiness, sadness, anger, surprise, disgust and shame) for 15 s. After each shot the participant must identify which of the six emotions the face expressed. The global score is the total number of correct answers (0–19).
ii) The FEDT consists of 30 pairs of pictures in each of which there are two faces that may be displaying the same or two different emotions. The pictures are displayed for 15 s. The participant should say whether each of the pairs of faces shows the same emotion or not. The total score is the number of successes (0–30).
iii) The ER40 shows 40 photographs in which the participant must identify each emotion expressed by the face in the photograph, choosing among five answer choices: anger, sadness, fear, joy, and no emotion. The total score is the number of successes (0–40).

To assess ToM, the Spanish version of the Hinting Task (HT) was administered. This is a test that includes 10 brief stories that the evaluator can read to the subjects as many times as needed to assure a correct understanding. All of the stories have two characters and, at the end of each story, one of the characters drops a fairly clear hint. The subject is asked what the character in the story really wanted to say with the comment he or she made. If the subject responds correctly, they receive 2 points; if not, information is added to make the hint clearer. If the subject responds correctly on this occasion, 1

point is given. An incorrect response amounts to a 0. The total test score ranges from 0 to 20 (46, 47).

Affective symptomatology in patients with BD was assessed through the Hamilton Depression Rating Scale (HDRS; 48; Spanish version, 49) and Young Mania Rating Scale (YMRS, 50; Spanish version, 51). Euthymia was defined by a HDRS score <8 and YMRS score <8; subsyndromal symptoms required scores of 8–14 in HDRS and/or 8–14 in YMRS (being free of psychometric criteria for episode; 52). Symptoms of SZ through the Positive and Negative Syndrome Scale (PANSS, 53; Spanish version, 54).

Global functioning was measured through the Global Assessment of Functioning (GAF, DSM-IV TR, 42). The GAF scale assesses the overall performance of Axis V of the DSM-IV, including psychological, social, and occupational functioning of the patient. Its score ranges from 1 to 100, with 1 being the lowest level of functioning and 100 the highest level of overall functioning. Furthermore, the number and type of episodes, duration of illness (in years), the number of hospitalizations and in the case of patients with BD, type (I or II) were recorded.

Data analysis

Statistical analyses were performed with the Statistical Package for Social Sciences (SPSS, PASW Statistics for Windows, Version 18.0. Chicago, IL, USA). The demographic and cognitive data were compared between groups using ANOVA and Bonferroni's *Post hoc* tests (when appropriate). The ANOVA results were also corrected for multiple comparisons using Bonferroni's test. When analyzing categorical variables (gender), chi-square test was applied. To control for the influence of BD affective symptoms (depression and mania) on social cognition tasks, we applied an ANCOVA test adjusted for HDRS and YMRS scores. We reported only effects that were still significant after controlling for these variables. In addition, we performed Pearson's correlations to examine the associations between the clinical scales and the social cognition tasks, as well as associations between clinical variables and GAF. When variables did not show a normal distribution (according to Kolmogorov-Smirnov test), Spearman rank-order correlations were conducted. Finally, multiple linear regressions were conducted to determine which factors, of those that were significant in the bivariate analysis, significantly contributed to explaining the variance of the continuous outcome variable (GAF score). As the sample was highly heterogeneous in terms of symptoms and symptoms may influence functional outcomes, the associations between both variables were analyzed to subsequently perform regression analyses in subgroups of patients defined by symptomatology. All statistical tests were 2-tailed and were carried out using a significance level of $\alpha = 0.05$. Data are presented as means ± standard deviation (SD).

Results

Sociodemographic characteristics of the sample are provided in Table 1. Age and proportion of men and women were similar; differences appeared in working status – largest proportion of employed workers in the control group – and a statistical trend to a higher proportion of married subjects in the control group, although the educational and socioeconomic levels were similar.

Regarding clinical variables of patients with BD and SZ, the groups had similar years of duration of illness and number of hospitalizations. The group of out-patients with BD had a mean score of 4.78 (SD = 4.67) on the YMRS and 7.61 (SD = 6.28) on the HDRS. Categorizing the HDRS scale, 23 patients (50%) met criteria for euthymia (HDRS < or equal to 7), 19 patients (41.3%) had depressive subsyndromal symptoms

Table 1. Sociodemographic and clinical characteristics of the sample

	BD $n = 46$	SZ $n = 49$	Control $n = 50$	Sign.* P
Age Mean (SD)	38.6 (10.63)	40.4 (10.5)	43.4 (13.6)	0.133
Gender (%)				
Female	29 (63)	21 (42.9)	29 (58)	0.118
Civil status (%)				
Single	22 (47.8)	29 (59.1)	18 (36)	0.063
Married	17 (36.9)	18 (36.7)	28 (56)	
Divorced	7 (15.2)	2 (4)	4 (8)	
Education (%)				
Primary	22 (47.8)	27 (55.1)	27 (54)	0.355
Secondary	24 (52.1)	21 (42.8)	20 (40)	
University	0 (0)	1 (2)	3 (6)	
Working status (%)				
Active	12 (26.1)	7 (14.6)	34 (68)	0.000*
Unemployment	26 (56.5)	15 (30.6)	8 (16)	
Pensioner	8 (17.3)	26 (54.7)	8 (16)	
Socioeconomic level (%)				
Low	19 (41.3)	26 (53.1)	15 (30)	0.192
Medium	19 (41.3)	18 (36.7)	28 (56)	
High	9 (17.3)	5 (10.1)	7 (14)	
GAF Mean (SD)	67.70 (16.44)	54.54 (15.41)	93.1 (4.8)	0.000*
Number of hospitalizations Mean (SD)	2.67 (1.94)	3.61 (3.51)	–	0.132
Duration of illness Mean (SD)	15.11 (9.44)	15.71 (7.91)	–	0.610

BD, bipolar disorder; SZ, schizophrenia; GAF, global assessment of functioning.
*ANOVA $P < 0.05$.

(HDRS between 8 and 14), and four patients (8.7%) met depressive episode criteria. Regarding the YMRS, 30 patients (65.2%) met criteria for euthymia (YMRS ≤ 7) and 16 (34.8%) had subsyndromal manic symptoms (YMRS 8-14). A total of 10 patients with BD (21%) presented mixed subsyndromal symptoms (HDRS ≥ 8 and YMRS ≥ 8). The group of patients with SZ showed a mean score of 24.16 (SD = 12.50) in PANSS subscale of positive symptoms, 25.77 (SD = 12.8) in the negative symptoms, and 61.75 (SD = 28.21) in the general psychopathology. The PANSS scores in the SZ group were categorized as 'mild–moderate' (n = 14) and 'markedly severe' (n = 35) on the basis of the PANSS total score cutoff of 75 (55).

When comparing performance in the task of ambiguous situations (AIHQ) on attributional style, there were significant differences among the three groups in the total scale (F (2,121) = 11.42, $P < 0.000$) and all subscales (AIHQ Hostility F (2,121) = 14.67, $P < 0.000$; AIHQ Intention F (2,121) = 11.18, $P < 0.000$, AIHQ Blame F (2,121) = 3.22, $P < 0.043$; AIAQ Anger F (2,121) = 5.30, $P < 0.006$; AIHQ Aggression F (2,121) = 4.80, $P < 0.010$). The score on the subscales of patients with BD was higher compared with the control group in all of them except the corresponding attribution of blame (after Bonferroni correction), where the score was similar between them. The score on the subscales of patients with SZ was higher compared with the control group in all of them (after Bonferroni correction). When comparing the scores on the subscales among patients with BD and SZ, similarities were found, except that patients with SZ scored higher on the subscale AIHQ attribution of intentionality (but this significance was lost after correction) (Table 2).

Regarding performance in other dimensions of social cognition, significant intergroup differences were found in the three tests of facial emotion recognition (FEIT F (2,130) = 16.12, $P < 0.000$; FEDT F (2,130) = 8.25, $P < 0.000$; ER40 F (2,130) = 17.51, $P < 0.000$). Performance in both groups of patients was significantly lower compared with the control group, so that the ability of facial emotion recognition was lower in the patient groups. There was no difference between patients with BD and patients with SZ, with a similar recognition of emotions in both groups. Performance in the ToM test (Hinting Task) showed statistical differences between the three groups (F (2,122) = 12.66, $P = 0.000$). Patients with SZ obtained lower scores than controls (F = 8.14, $P = 0.000$) and lower than patients with BD (F = 2.856; $P = 0.009$ with Bonferroni correction); patients with BD also performed worse than controls (F = 2.66, $P = 0.037$), although this difference lost statistical significance with Bonferroni correction. In summary, a gradation in ToM performance was found, patients with SZ obtaining the worst scores, BD an intermediate score, and controls the best.

Analysis of correlations between the scores in symptom scales and tasks of social cognition were also performed. All variables were normally distributed, except manic symptoms (YMRS; Kolmogorov-Smirnoff 1.468; $P = 0.027$) and theory of mind (Hinting Task; Kolmogorov-Smirnoff 1.818;

Table 2. Comparison between performance in attributional style and other social cognition tasks in BD, SZ, and controls

	BD n = 46	SZ n = 49	Control n = 50	Sign.* P	BD vs. SZ	BD vs. Controls	SZ vs. Controls
AIHQ Total	7.53 (1.49)	7.95 (1.61)	6.40 (1.40)	0.000*	0.184	0.001**	0.000**
AIHQ-HB Hostility	1.21 (0.34)	1.35 (0.42)	0.93 (0.25)	0.000*	0.166	0.000**	0.000**
AIHQ-IS Intentionality	1.81 (0.43)	1.98 (0.44)	1.55 (0.37)	0.000*	0.046	0.004**	0.000**
AIHQ-BS Blame	1.63 (0.48)	1.74 (0.45)	1.48 (0.44)	0.026*	0.284	0.161	0.043
AIHQ-AS Angry	1.72 (0.45)	1.69 (0.44)	1.44 (0.38)	0.002*	0.788	0.004**	0.006**
AIHQ-AB Aggressivity	1.23 (0.33)	1.20 (0.48)	0.99 (0.28)	0.025*	0.821	0.001**	0.010**
ER-40	26.33 (5.79)	26.27 (4.98)	31.43 (3.68)	0.000*	0.922	0.000**	0.000**
FEIT	7.93 (3.78)	7.51 (4.74)	12.65 (4.59)	0.000*	0.862	0.000**	0.000**
FEDT	23.85 (3.59)	23.92 (4.33)	26.41 (3.01)	0.000*	0.656	0.000**	0.001**
Hinting Task	17.14 (2.95)	14.85 (4.07)	18.31 (1.90)	0.004*	0.005**	0.030	0.000**

BD, bipolar disorder; SZ, schizophrenia; AIHQ, Ambiguous Intentions and Hostility Questionnaire; ER-40, Penn Emotion Recognition-40; FEIT, Facial Emotion and Identification Test; FEDT, Facial Emotion Discrimination Test.

*ANOVA $P < 0.05$.

** T-test with Bonferroni correction $P < 0.016$.

$P = 0.003$). In patients with BD, a significant positive correlation between depressive symptomatology (HDRS) and attributional style ($P = 0.012$) was found. Specifically, the correlation with five subscales was significant in the hostile and intent attribution, anger, blame attribution, and aggressiveness (see Table 3). Significant correlation was found between depressive symptoms and emotion recognition by ER40 ($P = 0.047$) and a robust trend by FEDT ($P = 0.052$). However, depressive symptoms (HDRS) did not correlate with ToM ($P = 0.338$) in patients with BD.

The relationships between the different dimensions of social cognition and psychopathology in patients with SZ are analyzed in Table 3. Significant correlations between ToM and clinical symptoms were found in the subscales of negative and overall symptoms, but not with positive ones. Emotion recognition, measured by ER-40, was also correlated with negative symptoms.

Regarding global functioning, assessed through the GAF, differences were found between the three groups. Patients with SZ (Mean = 54.76, SD = 15.32) showed a higher level of impairment compared with BD group (Mean = 66.78, SD = 16.55), this difference being significant (t (82) = 10.16, $P < 0.000$).

In BD, global functioning was highly correlated with the HDRS scores (r = -0.639; $P < 0.001$) but not with the YMRS ($r = 0.064$; $P = 0.671$). Due to the high impact of depressive symptoms on both the GAF and social cognition tasks, the sample was divided into two groups on the basis of the HDRS scores (HDRS ≤ 7; HDRS between 8 and 14) in order to perform bivariate analyses and regression models to identify potential related factors to global functioning for each subgroup. Patients in an acute depressive episode ($n = 4$) were not included. For those patients with a HDRS ≤ 7, significant bivariate analyses were found between the GAF and the HDRS scores ($r = -0.427$; $P = 0.047$), AIHQ Total ($r = -0.478$; $P = 0.028$), AIAQ Intentionality ($r = -0.480$; $P = 0.028$), ToM ($r = 0.418$; $P = 0.053$), and

Table 3. Correlations between social cognition subdomains and symptomatology in patients with BD and SZ

	BD		SZ			
Social cognition domains	HDRS	YMRS	PANSS Positive	PANSS Negative	PANSS General	PANSS Total
AIHQ total						
Coefficient	0.377*	0.109	0.254	0.350*	0.181	0.273
Sig.	0.012	0.482	0.097	0.020	0.239	0.072
AIHQ Hostility						
Coefficient	0.320*	0.106	0.144	0.300*	0.403*	0.361*
Sig.	0.036	0.500	0.350	0.048	0.007	0.016
AIHQ Intention						
Coefficient	0.305*	−0.003	0.096	0.103	−0.271	−0.107
Sig.	0.047	0.987	0.515	0.488	0.063	0.469
AIHQ Blame						
Coefficient	0.299*	−0.155	0.242	0.245	0.075	0.174
Sig.	0.052	0.321	0.113	0.093	0.611	0.236
AIHQ Anger						
Coefficient	0.278	0.157	0.181	0.253	0.135	0.196
Sig.	0.071	0.315	0.217	0.082	0.361	0.183
AIHQ Aggressiveness						
Coefficient	0.420*	0.344*	0.242	0.372*	0.477*	0.451*
Sig.	0.005	0.024	0.113	0.013	0.007	0.002
Hinting Task						
Coefficient	−0.148	−0.129	−0.281*	−0.456*	−0.454*	−0.459*
Sig.	0.338	0.404	0.005	0.001	0.001	0.001
FEIT						
Coefficient	0.144	−0.232	−0.304*	−0.361*	−0.332*	−0.374
Sig.	0.341	0.121	0.034	0.011	0.020	0.008
ER40						
Coefficient	−0.081	−0.057	−0.125	−0.297*	−0.094	−0.168
Sig.	0.594	0.705	0.394	0.038	0.522	0.264
FEDT						
Coefficient	0.086	−0.172	−0.047	−0.116	−0.068	−0.084
Sig.	0.570	0.253	0.747	0.426	0.643	0.567

BD, bipolar disorder; SZ, Schizophrenia; AIHQ, Ambiguous Intentions and Hostility Questionnaire; ER−40, Penn Emotion Recognition-40; FEIT, Facial Emotion and Identification Test; FEDT, Facial Emotion Discrimination Test; HDRS, Hamilton Depression Rating Scale; YMRS, Young Mania Rating Scale; PANSS, Positive and Negative Syndrome Scale.
*Pearson or Spearman Correlation is significant under 0.05 (bilateral).

ER40 ($r = 0.645$; $P = 0.001$). Clinical variables such as the YMRS, years of illness, and number of episodes were not related to the GAF. A significant model was obtained ($R^2 = 0.533$; $F = 10.254$; $P = 0.001$), in which ER40 ($\beta = 0.563$; $P = 0.003$) and AIAQ Intentionality ($\beta = -0.357$; $P = 0.045$) explained around 50% of the variance. When the bipolar sample with depressive subsyndromal symptoms (HDRS between 8 and 14) was selected, HDRS scores ($r = -0.526$; $P = 0.021$) and AIAQ Hostility ($r = -0.546$; $P = 0.018$) were correlated in the bivariate analyses and remained significant ($\beta = -0.430$; $P = 0.047$ and $\beta = -0.454$; $P = 0.037$ respectively) in the regression model ($R^2 = 0.491$; $F = 6.745$; $P = 0.009$).

Similarly, in the SZ group, global functioning was highly correlated with all the PANSS scores. Total PANSS was the measure used for the analyses and to divide the sample into two groups (PANSS < 75; PANSS > 75) to perform linear regression. In the subgroup with a total PANSS < 75, global functioning was highly correlated with the total PANSS score ($r = -0.740$; $P = 0.002$) and AAIQ Aggressiveness ($r = -0.657$; 0.039). A significant model was obtained ($R^2 = 0.904$; $F = 32.882$; $P < 0.001$), in which total PANSS ($\beta = -0.723$; $P = 0.001$) and AIAQ Aggressiveness ($\beta = -0.433$; $P = 0.010$) explained almost all the variance. In the subsample with a total PANSS score higher than 75, both the total PANSS score ($r = -0.528$; $P = 0.001$) and ToM ($r = 0.294$; $P = 0.085$) were introduced in the regression but only the total PANSS score ($\beta = -0.532$; $P = 0.006$) was significant in the model ($R^2 = 0.279$; $F = 6.177$; $P = 0.005$).

Discussion

The main finding of this study is the presence of a similar tendency to interpret hostility in ambiguous situations (attributional style) in out-patients with SZ and BD, compared with the control group. Both patient groups show these hostile social cognitive biases and a tendency to attribute negative events to others rather than to situational factors. Along with this, other social cognition domains are also impaired in both groups. Patients with BD show a capacity for emotional recognition similar to those with SZ and worse than control subjects. In contrast, patients with SZ show poorer ability to attribute mental states to others (ToM) and are more likely to attribute intention regarding patients with BD and controls. Another contribution of the study is to prove the decisive influence of subsyndromal clinical symptoms on these results. Subsyndromal symptoms have been reported to cause significant clinical, cognitive, and functional burden (52, 56, 57). In this study, the presence of subthreshold depressive symptoms in patients with BD was associated with hostile and intent attribution, anger, blame attribution, and aggressiveness, but not with other dimensions of social cognition as ToM. This could add some understanding to the nature of this cognitive deficit. Whereas 38% of patients recovered from an acute episode of BD had depressive subsyndromal symptoms at any time during follow-up (58), it is important to emphasize the negative effect that can lead on a dimension of social cognition that has so far been poorly studied: attributional style. This persistence of subsyndromal depressive symptoms has been associated with a shorter time to relapse, greater functional disability, worse quality of life, delay functional recovery, and poorer cognitive performance (52, 56, 59). Some studies have found a link between social cognition impairment in BD and functional impairment (39, 60, 61). Functional outcome generally refers to the degree of success that a person has with social connections, vocational pursuits, and degree of independent living. If the patient – influenced by their own unstable mood state – tends to misperceive these social situations as hostile or threatening, the possibilities for a good involvement dramatically decrease. Our regression analysis in the subsample of BD patients with subsyndromal depressive symptoms shows that HDRS score and an attributional style toward hostility are both strongly associated to global functioning. This potential role of depressive symptoms on social cognition performance is supported by recent studies showing a lack of awareness in patients with varying degrees of depression (62–64). However, despite these results, we should not underestimate the role of other social cognition domains – specially ToM – in functioning. Previous literature has specifically shown that, in both patients with SZ and BD, impaired ToM reasoning strongly predicts worse social and global functioning (65–67). In our study, ToM was assessed only through the Hinting Task, that is a highly used measure in clinical samples with acceptable psychometric properties (68, 69), but it has a very high dependence of verbal comprehension and lacks ecological validity. Hypothetically, ToM impact on global functioning could be different with a closer to real-world interaction assessment tool. Another issue to consider is the clinical significance of the regression results. Although some variables are statistically significant, further research should clarify their practical relevance to provide useful direction for intervention.

Furthermore, the symptoms of patients with SZ also have a negative impact on the performance of different dimensions of social cognition. While, in our sample, positive symptoms are not associated with any measure of social cognition, negative symptoms are associated with worse ToM, worse emotional recognition (measured by ER40), higher scores on attributional style, and, in particular, a more likely aggressive response. The PANSS general symptoms subscale was also associated with worse ToM, worse emotional recognition (measured by FEIT), and attributional tendency toward hostility and aggression. This is consistent with recent studies showing the greater relevance of the negative and general symptoms, compared with positive ones (70, 71). This also linked with the previous finding in patients with BD and points to the possibility that affective symptoms – both BD and SZ – (such as 'anxiety', 'depression', 'guilt', 'motor tension', or 'absorption' of the PANSS) negatively impact the way of processing social information and, ultimately, affect the overall functioning. According to our data, the most sensitive domain to the affective state – both in SZ and BD – would be attributional style. This reflects the relationship between depression and attributional style, as described in previous studies (34, 72).

The presence of a deficit in ToM and emotion recognition in patients with SZ has been already replicated (16, 73). This deficit seems relatively stable (74), task independent (75), present in the early stages (76), and associated with functional deficits (77). Controversy has appeared in the comparison between SZ and BD. Some studies (37, 38, 78) have found a gradation between SZ, BD, and controls, so that patients with BD show social cognition deficit, although more attenuated. Compared with controls, we found a deficit in emotional recognition, ToM, and attributional style of patients with BD. This agrees only in part with findings published previously. Six studies found a lack of emotional recognition regarding controls, 12 did not, and two studies even showed better performance in patients with BD vs. controls (79). Heterogeneity in social cognition tasks administered and other methodological issues such as the sample size and the effect of residual affective symptoms may explain this disparity in results. Unanimity exists regarding the presence of ToM deficit in BD (80). Our study aimed to assess different dimensions of the construct and included patients with both BD and SZ, not necessarily meeting criteria for symptomatic remission. This can be considered a methodological limitation, but increases the potential to generalize the data to the vast majority of outpatients who have residual symptoms. This has also allowed us to analyze the association between clinical measures of both diseases and their impact on social cognition tasks. Our clinical samples were recruited from a Mental Health Center (not in hospital tertiary level), but had higher levels of symptoms, compared with the work of Baez et al. (37) and Hoertnagl et al. (81), which may have influenced the results.

As regards limitations of the study, we should mention three points. First, all patients were receiving psychotropic medication, so emotional processing may be compromised (82). However, this is a clinical sample in out-patient treatment and therefore allows us to generalize the results to patients receiving treatment. Furthermore, the effect of drugs on social cognition remains inconclusive (83). Second, Martino et al. (84) have noted the potential relevance of attentional and executive functions in emotional processing in these patients. In this sense, a full neuropsychological evaluation was not carried out. A goal of a study assessing social cognitive domains in bipolar disorder and schizophrenia may be to establish the role of neuropsychological features as trait markers and possible endophenotypes of these illnesses. Unfortunately, this study, due to its limitations, does not allow for this. Our main objective was to examine the social cognitive bias (toward hostility) in both SZ and BD groups and to assess its impact on functioning. Definitely, it would be advisable to control the influence of neuropsychological variables on these social cognition measures in future research (85, 86). Finally, we examined an overall score of the emotion recognition tasks, but successes and failures in each particular emotion were not collected. This has prevented us to discern if any specific emotion is recognized with more difficulty, as mentioned in other studies (81, 84, 87).

Our work shows that out-patients with BD have a deficit in social cognition as important as patients with SZ, – though with profile differences. Our choice of studying real-world clinical samples and not applying stringent criteria of remission increases the external validity of the results, but definitely great caution is required when explaining its clinical significance. When we claim that both groups of patients with SZ and BD showed similar degree of hostile social cognitive biases, compared with the control group, we should not conclude that the nature of this phenomenon is the same for both disorders. For example, evidence from population-based studies (88) and biographical data (89, 90) suggests that bipolar traits are associated with leadership abilities, whereas this is not true for schizophrenia. Social cognition studies with more restrictive inclusion criteria show differences

between these two disorders regarding other measures of social cognition (39, 40, 91). So, the common presentation of hostile attributions in BD and SZ requires future clarification, keeping in mind the marked interindividual variability among all patients with BD regarding social cognition (92). In this study, we have found a predominant role of mood instability in the development of these biases in BD, underlining the importance of euthymia to better infer others' mental intentions and, secondary, to reach functional recovery. This is congruent with other studies (93) that show that mood instability parameters might contribute to understand the worse long-term functional outcome of patients with BD. In particular, those patients with residual depressive symptoms (approximately a third according to studies, 90) present significant problems in interpreting social information and, presumably, to function in the community. In this real-world and symptomatically heterogeneous sample, contrary to studies that obtained net differences between the two diagnostic categories, we have found diffuse barriers, which are consistent with the common genetic, clinical, cognitive, and biological markers overlap (94). However, to date, almost all research on the effectiveness of interventions on social cognition has been conducted in SZ, with promising results (95). Only one study has tested the effectiveness of the Social Cognition and Interaction Training in out-patients with BD, also showing positive results (43). Future research should clarify which pharmacological and psychosocial interventions can reduce the magnitude of this deficit in social cognition, both in SZ and BD.

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Declaration of interests

Dr. Lahera has served as advisor or CME speaker during the last 2 years for the following entities: Janssen, Lundbeck.

Dr. Benito has served as speaker during the last 2 years for Janssen.

Dr. Vieta has received grants and served as consultant, advisor, or CME speaker during the last 2 years for the following entities: AstraZeneca, Bristol-Myers Squibb, Ferrer, Forest Research Institute, Gedeon Richter, Glaxo-Smith-Kline, Janssen, Lundbeck, Otsuka, Pfizer, Sanofi-Aventis, Sunovion, Takeda, Teva, the Spanish Ministry of Science and Innovation (CIBERSAM), the Seventh European Framework Programme (ENBREC), and the Stanley Medical Research Institute.

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