Published in final edited form as:

Bipolar Disord. 2011 March ; 13(2): 164–172. doi:10.1111/j.1399-5618.2011.00906.x.

Emotional Modulation of Response Inhibition in Stable Patients with Bipolar I Disorder: A Comparison with Healthy and Schizophrenia Subjects

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Abstract

Objectives—Bipolar disorder (BD) has been associated with impairment in affective processing during depressive and manic states; however, there are limited data as to whether this population exhibits such difficulty during stable periods. We examined the pattern of affective processing in stable BD patients and compared their profile to that of healthy controls (HC) and patients diagnosed with schizophrenia (SZ).

Methods—336 subjects were administered an Affective Go/No-Go test to evaluate target detection of negatively-valenced, positively-valenced, and neutral stimuli. Accuracy and response bias served as dependent variables in a series of multivariate analyses of covariance to test for group differences.

Results—The BD, relative to the HC group exhibited response biases toward *negatively-valenced* information ($p < .01$). Deficits were also evident in discrimination of and accurate responses to *positively*-valenced information in the BD group versus the HC group ($p < .05$). In contrast to the controls, the SZ group performed poorly on all task components and was less accurate across all conditions regardless of affective valence ($p < .01$). Patients with SZ evidenced reverse biases for positive information, as they were *less* likely to respond to positive words ($p < .05$) despite comparable response bias on neutral and negative conditions.

Conclusions—Affective processing impairment evident in BD is a feature of the disorder that is present even during stable periods. Prior studies comparing BD with SZ have highlighted clear quantitative but inconsistent qualitative differences in cognitive functioning. Our data suggest that a response bias toward *negative* stimuli may be a critical and relatively specific feature of BD.

Keywords

Bipolar I Disorder; Affective Processing; Affective Go/No-Go; Target Detection; Affective Bias

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Financial Disclosures: Drs. Gopin and DeRosse report no competing interests. Dr. Burdick has served on the speaker's bureau for Merck. Dr. Goldberg has consulted for Merck and GSK over the past year and receives royalties for use of the BACS in clinical trials from Neurocog Trials. He was awarded an investigator initiated grant from Pfizer. Dr. Malhotra has served as consultant or speaker for Bristol-Myers Squibb, Merck, Astra Zeneca, Vanda Pharmaceuticals and Clinical Data, Inc, and has received research support from Pfizer, Janssen Pharmaceuticals, Bristol-Myers Squibb, and Eli Lilly.

Introduction

Although bipolar disorder and schizophrenia are classified as distinct illnesses in both the *DSM-IV-TR* (1) and the *ICD-10* (2), the clinical presentations of the two diagnoses have both shared and unique features (3). For instance, patients who are in the midst of experiencing their first schizophrenic episode frequently present with depressive symptoms (4;5), and both mania and depression can be comorbid with chronic schizophrenia (6). Similarly, psychotic features, a hallmark of schizophrenia, are present in approximately 50% of patients with bipolar I disorder (7).

It is not surprising, therefore, that these two patient populations often exhibit similar patterns of performance on neuropsychological assessments (8). Although it is widely accepted that patients diagnosed with schizophrenia demonstrate more global and severe cognitive deficits than those with bipolar disorder (9;10), the latter have been consistently noted to exhibit clinically significant cognitive difficulties (11;12). Specific impairment in attention, verbal memory, and executive functioning have been reported, even during periods of affective remission (13;14;15).

Similarly, both patient populations demonstrate abnormalities in affective processing. Several investigators have reported that patients with schizophrenia have difficulty quickly and effortlessly processing emotional words (16;17;18). Although the impairment has been reported for words with both positive and negative valences, the majority of the literature suggests that patients diagnosed with schizophrenia exhibit greater impairment in the processing of words that have positive emotional connotations (i.e., positively-valenced; 8). It has been suggested that this reflects an affective ambivalence (19) which may be related to paranoid delusions (20), or negative symptoms (21). In contrast, several prior studies have demonstrated that, in the bipolar population, it is negatively-valenced material that causes interference on Stroop-like, inhibitory tasks (22;23;24). One prior study that employed a Go/No-Go task revealed that the affective processing bias evident in bipolar patients is mood congruent (25); the patients who were in the midst of a depressive episode exhibited a bias toward negative information, while manic patients displayed a bias toward positive stimuli. Although there remains a paucity of data on affective bias in BD during periods of stability, it is likely that some of the emotional biases noted during acute phases of the illness persist during euthymia. This hypothesis is supported by literature indicating that stable, trait-like measures of temperament in patients with BD are frequently characterized by dysthymia and cyclothymia (26;27;28). Moreover, there is consistent evidence of lower self-esteem in BD patients, even when affective symptoms are well-controlled (29). Thus, while acute, syndromal-level psychopathology may be adequately treated, chronic difficulties in temperamental regulation and disordered views of oneself remain quite stable in patients with BD over time and are likely to influence performance on tasks requiring processing of emotionally-valenced information.

To test this hypothesis, we examined the pattern of affective processing in stable bipolar patients relative to that of healthy controls using an Affective Go/No-Go task. In addition, to assess the relative specificity of these deficits to BD, we compared the performance of patients diagnosed with bipolar disorder to that of patients diagnosed with schizophrenia.

Materials and Methods

Participants

Data collection was cross-sectional via two ongoing studies that were approved by the North Shore Long Island Jewish Health System Institutional Review Board. Healthy Controls: The healthy control (HC) subjects (n = 144) were recruited from the ZHH Healthy Volunteer

Program. These participants were administered the Structured Clinical Interview for DSM-IV, Non-Patient edition (SCID – NP; 30) in order to rule out any Axis I disorder.

Patients—The clinical samples (bipolar and schizophrenia) were recruited from the Zucker Hillside Hospital (ZHH) outpatient division. Individuals who provided written, informed consent were eligible to participate in the respective investigation if there was no history of CNS trauma, known neurological disorder, or learning disability. In addition, patients who received a DSM-IV diagnosis of current/recent substance abuse or dependence (i.e., within the past three months) were excluded from participation. For the purposes of the present investigation, participants were also excluded if their premorbid IQ was estimated to be below 70 on the WRAT Reading subtest (31; see below).

Clinical diagnoses were determined using the Structured Clinical Interview for the DSM-IV (SCID-IV) and a rigorous consensus conference consisting of at least 3 expert diagnosticians (e.g., a combination of senior faculty, residents, fellows, and other trained SCID raters). Based on consensus diagnoses, the resulting sample was divided into 3 distinct groups: Bipolar Disorder (BD), Schizophrenia (SZ), and Healthy Control (HC) subjects. The BD group consisted of 59 patients with DSM-IV diagnoses of bipolar I disorder who were characterized as clinically stable at the time of testing as per Hamilton Depression Rating Scale (HAM-D; 32) scores that were less than or equal to 12 [mean (SD) = 6.03 (3.47)] and Clinician Administered Rating Scale for Mania (CARS-M; 33) scores that were less than or equal to 12 [mean (SD) = 5.60 (6.57)]. The bipolar group was not defined as strictly euthymic at the time of assessment, but all were stable outpatients as per relatively low mood ratings upon evaluation. This was determined based on the aforementioned HAM-D and CARS-M scores, as well as the participants' responses on the Brief Psychiatric Rating Scale [BPRS; 34; mean (SD) = 26.05 (5.20)] and the Scale for the Assessment of Negative Symptoms [SANS; 35; mean (SD) = 19.40 (10.78)]. The SZ group (n = 133) consisted of participants who received a DSM-IV diagnosis of schizophrenia and had no current evidence of significant affective symptoms, using the same HAM-D cutoff scores applied to the BD group [mean (SD) = 5.68 (3.39)]; however, mania ratings were not obtained for the schizophrenia subjects. These participants were also administered the BPRS and the SANS to quantify and determine the state of their psychiatric symptoms. The mean (SD) BPRS score was 28.97 (6.71); the mean (SD) SANS score was 24.81 (11.04), scores which are consistent with mild to moderate symptomatology. Moreover, the SZ participants had not been hospitalized in the 6 months prior to the evaluation. Individuals diagnosed with schizoaffective disorder were excluded from participation.

After all criteria were met, the sample consisted of 222 men and 114 women. The participants ranged in age from 18–78 years (mean = 40.35, SD = 11.85). According to demographic data obtained from the participants, 34.2% of the sample was Caucasian, 6.3% were Asian/Pacific Islander, 39.6% were African American of non-Hispanic origin, 14.0% were of Hispanic origin, and 6.0% were of mixed descent/other. The groups differed significantly in sex, age, ethnicity, and estimated premorbid general intellectual functioning (IQ); therefore, these variables served as covariates in all subsequent analyses. Participant characteristics are summarized in Table 1.

Measures

As part of their participation in the study, participants were administered a comprehensive assessment battery consisting of behavioral ratings, a structure diagnostic interview, an assessment of premorbid general intellectual functioning, and an affective processing task.

Diagnosis—The Structured Clinical Interview for DSM-IV (SCID-IV; 30) was administered in full to diagnostically characterize the patient sample. The ZHH Research Division staff members have expertise in the use of this standardized diagnostic interview and classification systems and have demonstrable inter-rater reliability within the group (ICC > 0.8 across raters). Subjects' reports and data from all available medical records were compiled by the interviewer into a detailed narrative case summary, which was presented to senior faculty, residents, fellows, and other trained SCID raters at a weekly diagnostic conference to establish a consensus DSM-IV diagnosis. This information was then de-identified and entered into a departmental database.

Current Mood Symptoms—The Hamilton Rating Scale for Depression (HAM-D; 32) was used to assess the severity of patients' depressive symptoms. ZHH raters are also trained to a high inter-rater reliability (ICC > 0.80) on the administration of the HAM-D. The bipolar group was also rated on current mania symptoms using the CARS-M (33), which provides a measure of manic features within the prior week, including a score for psychotic symptoms. Because this scale was not administered to the schizophrenia group or the healthy controls, we were unable to incorporate these data into the subsequent analyses. The Brief Psychiatric Rating Scale (BPRS; 34) and The Scale for the Assessment of Negative Symptoms (SANS; 35) were used to assess the positive, negative, and affective symptoms in both the BD and SZ groups.

Premorbid IQ and Affective Processing Assessment—Wide Range Achievement Test - Third Edition, Reading (WRAT-3; 31): The WRAT-3 Reading subtest assesses single-word reading skills. In this task, the participant is required to read 75 words of increasing difficulty. Scoring is based on correct pronunciations of the words. Single word reading, like general knowledge and vocabulary, has long been thought to be particularly resistant to the effects of deterioration associated with brain disease (36) and is considered an estimate of pre-morbid functioning in patient populations and a measure of general cognitive abilities in healthy individuals.

Affective Go-No Go: The test was comprised of three conditions: discrimination of positively-valenced words, discrimination of negatively-valenced words, and discrimination of animacy in words of neutral valence. Each condition was comprised of five blocks of 18 words each. Stimulus duration was 500 ms and ISI was 1000 ms for all conditions. The ratio of targets to non-targets was 50:50 in all conditions to prevent development of an overt response-bias. Words in the emotional conditions had valences of greater than 1.93 (as based on Affective Norms of English Words; see 37), while words in the neutral condition had valences less than 1.90. For the emotional conditions nouns, verbs, and adjectives were utilized; only nouns were used for the animacy condition. Across all conditions, words were matched on frequency of use, word length, and imageability (i.e., how concrete versus abstract) using the MRC Psycholinguistic Database. In the positive affective condition, participants were instructed to press the spacebar on the keyboard whenever they viewed a word that they deemed to be positive ("happy") in the presence of negatively-valenced distracters. Similarly, in the negative condition, participants were requested to respond every time they viewed a word that they deemed to be negative ("sad, scary") in the context of positive non-targets. In the neutral, animacy decision condition participants were told to press each time that they viewed a word representing a living thing versus a non-living object. This measure is conceptualized as a target detection task in which an individual's mood state may result in shifts in response bias, discriminability, or reaction time (RT) due to over- or under-processing of the various classes of stimuli (positive, negative, neutral).

Data Analysis

For each Affective Go/No-Go condition (negative, positive, neutral), the percent of correct responses was calculated, as was the percent of false alarms. Using these computations, d' and β were calculated (see 38 and 39, respectively) so that the accuracy and response bias of the participants could be analyzed.

A series of repeated measures ANCOVAs was then conducted to analyze group (i.e., BD, SZ, HC) differences in performance during the negative, positive, and neutral conditions of the Affective Go/No-Go; age, sex, race, and estimated premorbid IQ served as the covariates in the analyses. Median reaction time for responses in which targets were correctly identified, d' -accuracy, and β served as the dependent variables. A series of follow-up, pairwise, one-way ANOVAs were then conducted to assess the nature of any significant interactions. The various conditions and the difference score between pairs of conditions (e.g. negative minus neutral) served as the dependent variables during these post-hoc analyses. Finally, two backward likelihood ratio regression analyses (predicting BD versus HC status and BD versus SZ status, respectively) were conducted to gain a clearer understanding of the specificity of these measures. All relevant affective Go/No-Go variables (i.e., negative median RT, positive median RT, neutral median RT, negative d' , positive d' , neutral d' , negative B , positive B , and neutral B) were entered into the regression (in the order listed); sex, race, age, and estimated premorbid IQ were included as covariates in both analyses. In addition, HAM-D total score was included as a covariate in the regression predicting affected group status.

Results

Affective Go/No-Go d'

To examine the effect of diagnosis (i.e., BD, SZ, HC) on d' -accuracy, a repeated measures ANCOVA (covarying for sex, age, race, and estimated premorbid IQ) was conducted in which d' -accuracy during each condition (positive, negative, neutral) served as the dependent variables. Results revealed a significant main effect for *diagnosis* [$F = 23.07$ (2,321), $p < .001$], such that, overall, the SZ patients' responses were less accurate than that of the BD patients', whose performance was poorer than that of the HC group. The main effect for *race* and for *estimated premorbid IQ* were also significant [$F = 13.13$ (1, 321), $p < .001$; $F = 34.08$ (1,321), $p < .001$, respectively], as was the *diagnosis* $\times$ *condition* interaction [Wilks' $\lambda = 2.80$ (4, 640), $p < .05$]. Follow-up analyses revealed that, during the positive condition, the responses of the BD group were significantly less accurate than the response pattern of the HC group ($p < .05$). In contrast, during the negative and neutral (alive) conditions, there were no significant differences between the performance of the BD and the HC groups ($p = .87$ and $p = .88$, respectively).

Comparison of the BD and SZ groups' performance revealed that the responses of the BD group during the negative condition were significantly more accurate than that of the SZ group ($p < .001$). Similarly, during the positive and neutral conditions, the BD group responded significantly more accurately than did the SZ group ($p < .01$ and $p < .001$, respectively; see Figure 1).

Affective Go/No-Go β

Similar analyses were then conducted to examine the group difference in response bias (β) across the three conditions. There was a significant main effect for *race* [$F = 10.71$ (1, 321), $p < .01$]. The main effects for *diagnosis* approached significance ($p = .08$), and the main effect for *condition* was not significant ($p = .58$); however, the *diagnosis* $\times$ *condition* interaction was significant (Wilks' $\lambda = 3.04$ (4, 640), $p < .05$). Post-hoc analyses

revealed that the BD group's response bias differed from that of the HC group during the negative condition ($p < .01$) but not during the other two conditions ($p = .80$ for the positive condition, and $p = .89$ for the neutral condition). Similarly, the performance of the BD and SZ groups was disparate during the negative condition; the response bias of the BD group was significantly greater than that of the SZ group ($p < .001$). There was no significant difference in response during the positive ($p = .12$) and the neutral ($p = .99$) conditions (See Figure 2).

To further assist in interpreting these analyses, a difference score reflecting the difference between the response bias during the positive and the neutral conditions was calculated (i.e., β for positive stimuli minus β for neutral stimuli). Similarly, the difference between the negative and the neutral conditions was computed (i.e., β for negative stimuli minus β for neutral stimuli). The resulting difference scores then served as dependent variables in a series of univariate ANCOVAs. Subsequent analyses revealed that the BD group's response bias for positive relative to neutral stimuli did not differ from that of the HC group ($p = .97$), while the bias for negative relative to neutral stimuli was significantly different ($p < .01$). Similarly, the BD and SZ groups did not differ in the response bias in reaction to positive relative to neutral stimuli ($p = .17$); however, the BD and SZ groups differed in response bias for negative relative to neutral stimuli ($p < .001$).

Affective Go/No-Go Reaction Time

Group differences in median RT across the three conditions were next analyzed. There was a significant main effect for *age* [$F = 30.19$ (1, 285), $p < .001$], *sex* [$F = 8.51$ (1, 285), $p < .001$], *race* [$F = 6.91$ (1, 285), $p < .01$], and *estimated premorbid IQ* [$F = 4.74$ (1, 285), $p < .05$]. In addition, there was a significant main effect for *diagnosis* [$F = 14.58$ (2, 285), $p < .001$], such that the overall RT of the HC group was fastest, and the RT of the BD group was faster than that of the SZ group. The main effect for *condition* was not significant ($p = .79$), but the *diagnosis* $\times$ *condition* effect was significant [Wilks' lambda = 4.15 (4, 568), $p < .01$]. Follow-up analyses revealed that the BD group did not differ from the HC group in the speed with which they responded to negative stimuli ($p = .14$; See Figure 3). However, the BD group's median RT for positive stimuli was significantly slower than the HC group's ($p < .01$), as was their RT for neutral stimuli ($p < .05$). Patients with SZ were slower than the HC group and the BD group on all conditions regardless of affective valence (all p -values $< .001$); however, the pattern of RT across conditions differed significantly. Specifically, we calculated difference scores to compare RT to negative and positive stimuli relative to neutral stimuli (negative minus neutral; and positive minus neutral). When evaluating these patterns, we found that BD patients had a significantly greater difference in RT on positive trials versus neutral trials than did SZ patients ($p < .05$). No such difference was noted for negative versus neutral stimuli ($p = .52$).

Regression Analyses

To refine the aforementioned findings and gain a clearer understanding of the differences in performance between the groups, two backward stepwise likelihood ratio logistic regression analyses were conducted. Results were fully consistent with the primary analyses. Namely, the variables that remained in and significantly contributed to the model predicting BD versus HC group status included race ($B = 1.930$, $p < .001$), as well as median RT ($B = -.007$, $p < .01$) for *positive* stimuli, and d' -accuracy for *positive* stimuli ($B = .243$, $p = .066$). Overall, this model was found to adequately discriminate the BD and the HC participants from one another [area under the curve = .78 ($p < .001$), confidence interval of .70–.86; optimal sensitivity = .69, specificity = .80]. In contrast, when affected (BD versus SZ) status was predicted, the variables that remained in and significantly contributed to the model were age ($B = .064$, $p < .01$), sex ($B = 1.639$, $p < .001$), race ($B = -.883$, $p < .05$), d' for *neutral*

stimuli ($B = -.510, p < .01$), and Beta for *negative* and *neutral* stimuli ($B = -.088, p < .05$ and $B = .225, p < .05$, respectively). Once again, the overall model was able to adequately discriminate between the BD and SZ participants [area under the curve = .78 ($p < .001$), confidence interval of .71–.86; optimal sensitivity = .71, specificity = .68]. Of note, the depression ratings did not remain in the final equation, reflecting the trait-like nature of performance on this task.

Discussion

Our data suggest that bipolar I patients, even during periods of psychiatric symptom stability, experience and react to affective information in a manner that is distinct from healthy controls and from other psychiatric patients (i.e., schizophrenia). On a task that assayed the emotional modulation of target detection (Affective Go/No-Go), healthy individuals tended to respond more accurately when presented with affective information than when neutral stimuli were presented. Additionally, the healthy controls reacted more slowly to negatively-valenced information than they did to either neutral or positively-valenced stimuli (though see 40). The response profile of the stable bipolar patients differed significantly from the healthy controls. Specifically, negatively-valenced information appeared to engage this patient population, such that they were more willing to respond to the target stimuli, which is indicative of a liberal response bias toward negative information. In addition, a deficit was evident in their response to positive stimuli, as their ability to discriminate and respond accurately to positively-valenced information was impaired, and their reaction times were increased relative to that of healthy controls. As such, BD patients' pattern of performance suggests that, as a group, they have a tendency to attend more readily to negatively-valenced information than to material with less emotional content and that positively-valenced information is processed less efficiently.

Of particular interest in this study was the comparison between BD and SZ patients' performance. In contrast to the pattern noted in BD, patients diagnosed with schizophrenia performed poorly on all aspects of the task relative to healthy subjects and were less accurate across all conditions regardless of affective valence. Inasmuch as there was an effect of emotionally-laden information, it was in the opposite direction as that noted in patients with BD. Patients with SZ evidenced a reverse bias (more conservative) for positive information such that they were significantly *less* likely to respond to positive words than were healthy controls, despite comparable response bias on neutral and negative conditions. This pattern of performance is indicative of a lack of normal responsiveness to affective material, consistent with prior reports of affective ambivalence in SZ (19).

Although several studies have indicated an affective information processing bias and/or deficit in patients with BD, most studies have evaluated patients during an acute state of the illness with mood-state congruent effects (41;42). We have extended prior findings to demonstrate an attentional bias toward negatively-valenced information in stable patients with BD, a result that withstands controlling for current subsyndromal depressive symptoms. Interestingly, the BD group's enhanced bias toward negative words allows for normal response accuracy when compared with healthy subjects, consistent with a compensatory mechanism. In contrast, no such bias is noted for positive stimuli, and accuracy is impaired for this condition. Data from functional neuroimaging studies have provided evidence of a neural basis for such a hypothesized compensatory mechanism, where euthymic BD patients' performance on an affective Go/No-Go task was normal but overactivation of temporal, orbitofrontal, anterior, and cingulate cortices was evident as compared with healthy subjects (43). The specificity of the affective bias (toward negative but not positive words) is of particular interest with regard to the neurobiological basis of the illness, particularly in the case that it may serve a beneficial purpose in normalizing information

processing. It is difficult to speculate as to why stable bipolar patients maintain, or develop, a negative bias but not a positive one; however, subclinical depressive symptoms are very common, even in BD patients who are characterized as fully remitted (44), and are likely to color the way a patient perceives his/her world. In addition, personality style, which is believed to be a stable trait, is often characterized by depressive features and low self-esteem in patients with BD (26;27;28;29). Manic and hypomanic symptoms may be more episodic in BD patients, and they tend to be addressed more readily by mood stabilizing medications with a more complete remission (45). Although we found no significant correlations between current mood ratings and performance on the Affective Go/No-Go, it is possible that standardized rating scales may not be tapping into the underlying cognitive biases that develop over the course of an affective illness.

The Affective Go/No-Go task is a target detection task, albeit with a superimposed affective processing component, which requires subjects to detect targets while simultaneously inhibiting response to competing distracters. It should be noted that response inhibition has been previously identified in meta-analyses as the cognitive domain most likely to represent a trait-like disturbance associated with genetic predisposition to bipolar disorder (46;47). Few studies have incorporated tasks of emotion-based target detection when studying the relatives of patients with BD; however, early data suggest that non-symptomatic offspring of parents with BD demonstrate a memory bias toward negatively-valenced information as compared with healthy children who are not at increased genetic risk for the illness (48). Consistent with a trait-like feature of the disorder, recent data from functional neuroimaging indicate that the aforementioned overactivation of several brain regions in response to emotional stimuli is also present in unaffected relatives of patients with BD (49).

The current study has several limitations. Specifically, while bipolar patients were assessed during a stable phase of illness, a strict definition of euthymia was not applied. However, regression analyses indicated that the specific pattern of performance on the Affective Go/No-Go was noted even after controlling for subsyndromal symptoms of depression. All patients in our sample were taking psychotropic medications, and we were unable to control for this factor due to the heterogeneity of treatment in both patient groups. It is possible that unmedicated subjects may respond differently to these affective tasks, as has been shown in some (50) but not all (51) depressed subjects; however, *unmedicated* bipolar and schizophrenia patients would not be representative of individuals in these diagnostic groups, the vast majority of whom are consistently taking at least one major psychotropic medication. Finally, we were unable to match our samples perfectly on several demographic features including race, sex, age, and estimated premorbid general intellectual functioning. Several of these factors did contribute to the prediction of group status in the regression models, as would be expected based on epidemiological data; nonetheless, even after controlling for these differences, affective cognitive performance added significantly to the correct classification of subjects.

Although future investigations should aim to ascertain whether there is a particular pattern of deficient affective processing that is exhibited during stable periods (negative versus positive), the more salient finding is that impairment in affective processing is a feature of bipolar disorder even in the absence of acute symptomatology. Of particular interest was the specificity of these deficits in comparison with a stable sample of patients with schizophrenia. Given the recent effort to better understand the commonalities and the differences among these two major mental illnesses, these data add significantly to the understanding of the information processing abnormalities that are specific to patients with bipolar illness. Taken together, these findings suggest that affective processing dysfunction should be considered amongst the core features of bipolar disorder. Future studies in strictly-defined euthymic BD patients are warranted.

Acknowledgments

Financial Support for this work included grants from the National Institute of Mental Health (NIMH) to KEB (K23MH077807; R03MH079995) and to AKM (R01MH79800; P50MH080173)

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d' **Figure 1.**

Comparison of the response accuracy of the BD, SZ, and HC participants during the three conditions (i.e., Negative, Positive, Neutral) of the Affective Go/No-Go. Diagnosis $\times$ condition interaction, with D' serving as the dependent variable. The diagnosis $\times$ condition interaction was significant [Wilks' lambda = 2.80 (4, 640), $p < .05$]

Figure 2. Comparison of the response bias of the three groups during the Negative, Positive, and Neutral conditions of the Affective Go/No-Go. Diagnosis $\times$ condition interaction, with beta serving as the dependent variable. The diagnosis $\times$ condition interaction was significant [Wilks' lambda = 3.04 (4, 640), $p < .05$]

Figure 3.

Differences in the groups' median reaction time across the three conditions of the Affective Go/No-Go

Diagnosis $\times$ condition interaction, with median reaction time serving as the dependent variable. The diagnosis $\times$ condition effect was significant [Wilks' lambda = 4.15 (4,568), $p < .01$]

Table 1

Descriptive characteristics of the entire sample, divided into BD, SZ, and HC groups

Group	BD (n= 59)	SZ (n=133)	HC (n=144)	Significance
Mean Age (SD)	40.91 (11.98)	43.32 (9.77)	37.38 (12.88)	$F = 9.21 (2,335), p < .001$ *
% Males	57%	77%	59%	$\chi^2 = 12.90, p < .01$ **
% Caucasian	61%	32%	24%	$\chi^2 = 25.50, p < .01$ ***
Premorbid IQ	99.12 (10.48)	93.13 (11.29)	98.31 (11.48)	$F = 9.45 (2,335), p < .001$ ****

* SZ and BD > HC

** SZ > HC and BD

*** BD > HC and SZ

**** SZ < HC and BD