Perception of facial emotion in adults with bipolar or unipolar depression and controls

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ABSTRACT

Previous research indicates that patients with depression display deficits in their ability to perceive emotions. However, few studies have used animated facial stimuli or explored sensitivity to facial expressions in depressed individuals. Moreover, limited research is available on facial processing in unipolar versus bipolar depression. In this study, 34 patients with DSM-IV major depressive disorder (MDD), 21 patients with DSM-IV bipolar disorder (BPD) in the depressed phase, and 24 never-depressed controls completed the Emotional Expression Multimorph Task, which presents facial emotions in gradations from neutral to 100% emotional expression (happy, sad, surprised, fearful, angry, and disgusted). Groups were compared in terms of sensitivity and accuracy in identifying emotions. Our preliminary findings suggest that subjects with bipolar depression may have emotional processing abnormalities relative to controls.

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1. Introduction

Depression is associated with impairments in judging facial expressions, a crucial part of social interaction. Such deficits may offer an explanation for the decreased psychosocial functioning that many people with depression experience as their symptoms become more severe (Judd et al., 2005, 2000). Previous studies noted that patients with unipolar and bipolar depression are less accurate than controls at identifying facial expressions (Derntl et al., 2009; Gray et al., 2006; Gur et al., 1992; Leppanen et al., 2004; Persad and Polivy, 1993; Rubinow and Post, 1992; Surguladze et al., 2004), an impairment that could be due to difficulty in attending to salient facial features when viewing faces (Loughland et al., 2002).

Several studies have indicated that these deficits reflect a negative bias in perception, where happy faces are interpreted as neutral, and neutral faces are interpreted as sad (Gur et al., 1992; Leppanen et al., 2004; Surguladze et al., 2004; Yoon et al., 2009). Subjects with unipolar depression also appear to be slower to detect positive facial expressions than healthy volunteers (Suslow et al., 2004).

Moreover, the way that patients view negative emotions corresponds with the course of their illness. Individuals with unipolar depression who perceive high levels of negative emotions when viewing faces tend to have a course of illness characterized by greater severity of depression, persistence of symptoms, and likelihood of relapse (Bouhuys et al., 1999; Hale, 1998). However, one study found that even after remission, patients with a history of recurrent depression displayed impaired sensitivity to happy faces as compared to controls (LeMoult et al., 2009).

In terms of bipolar disorder (BPD), studies have found that patients are less accurate at identifying certain emotions. For instance, subjects with BPD were less accurate than controls in identifying surprised (Bozikas et al., 2007; Summers et al., 2006) and fearful facial expressions (Bozikas et al., 2007). Other studies found generalized deficits in recognizing expressions as opposed to emotion-specific impairments. Subjects with bipolar depression were less accurate at identifying emotional expressions overall as compared to controls, (Gray et al., 2006). In addition, generalized impairments were found in euthymic BPD patients as well, suggesting a trait deficit in emotional processing (Bozikas et al., 2006; Derntl et al., 2009).

Traditionally, tasks that assess emotion perception use static facial stimuli representing happy, sad, and neutral expressions. These tasks, however, fail to emulate the range of emotions and the

varying intensity of expression that people experience in real-life situations. Preliminary evidence suggests that tasks incorporating a wider variety of facial expressions reveal a deficit across emotions (Asthana et al., 1998; Persad and Polivy, 1993). Recently, researchers started to use forms of animated facial stimuli displaying various intensities, providing a more realistic and sensitive measure of emotion perception (Gray et al., 2006; Rich et al., 2008b; Summers et al., 2006; Venn et al., 2004).

Animated facial stimuli allow researchers to measure sensitivity to facial expressions, which represents an important aspect of social interaction. While several studies have explored sensitivity in BPD, very few have used animated facial stimuli with unipolar depression. Preliminary findings for BPD indicate that euthymic adults do not display impaired sensitivity (Venn et al., 2004); however, during the depressed phase of BPD, patients exhibited reduced sensitivity in recognizing certain emotions (Gray et al., 2006; Summers et al., 2006). However, findings have been inconsistent regarding which emotions are pertinent to this deficit. Although a reduced sensitivity to happiness is consistently reported, the results vary for negative emotions. One study found no deficit for negative emotions (Gray et al., 2006), whereas another study discovered a deficit in identifying disgusted and fearful faces, but not sad faces (Rich et al., 2008b). Summers et al. (2006) found that a group of individuals with bipolar depression were less likely to identify angry faces than the euthymic BPD group. Given the variation in findings, more research is clearly needed to decipher the nature of the deficit.

Although most studies exploring sensitivity to facial expressions have been conducted in individuals with BPD, preliminary results suggest deficits in this area for Major Depressive Disorder (MDD) as well. Gur et al. (1992) found that BPD and MDD subjects with higher negative affect displayed more impaired sensitivity to sad faces. Surguladze et al. (2004) found that individuals with MDD tended to mislabel mildly happy faces. However, these studies used static as opposed to animated facial expressions, which might influence the nature of the results. To our knowledge, few studies have compared the perception of facial emotion in individuals with unipolar versus bipolar depression, and the studies that included both unipolar and bipolar participants did not analyze the data separately for each diagnostic group (Gur et al., 1992; Rubinow and Post, 1992).

This study used animated facial stimuli to compare the accuracy and sensitivity of emotion perception between individuals with unipolar and bipolar depression as well as controls. We hypothesized that the MDD and BPD groups would exhibit an overall decreased sensitivity to emotional faces compared to controls. Moreover, we predicted that these groups would be less accurate than the control group when labeling emotions.

2. Materials and methods

2.1. Subjects

Participants were recruited from ongoing studies at the National Institute of Mental Health (NIMH). The subjects met DSM-IV criteria for MDD ($n = 34$) or BPD I or II, depressed phase ($n = 21$) as determined by the Structured Clinical Interview for Axis I DSM-IV Disorders–Patient Version (SCID-P) (First et al., 2001). All participants were free of acute medical illnesses, current psychotic features, and substance abuse or dependence for the past three months. The subjects with unipolar depression and one subject with BPD were medication-free for approximately two weeks before testing. All other subjects with bipolar depression were receiving therapeutic doses of lithium or valproic acid for at least three weeks before testing. Twenty-four healthy subjects were recruited through advertisements on campus and in local newspapers and underwent a screening visit at the NIMH that included a medical history and physical exam performed by a physician and a Structured Clinical Interview for DSM-IV, non-patient version. Healthy control subjects had no current or past psychiatric or neurological illness, substance abuse, a family history of psychiatric illness, or medical conditions that could affect cognitive performance. All SCID interviews were administered by trained clinicians with high inter-rater reliability (kappa = .93).

2.2. Procedures

The Montgomery-Åsberg Depression Rating Scale (MADRS) was administered by trained clinicians to all participants in order to assess the severity of depression (Montgomery and Asberg, 1979). The Young Mania Rating Scale (YMRS) was administered by trained clinicians to the MDD and BPD groups to assess manic symptoms (Young et al., 1978). Inter-rater reliability was high for both scales (MADRS: ICC = .95; YMRS: ICC = .97). In order to assess IQ, all participants completed the matrix reasoning and vocabulary subtests of the Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999). The study was approved by the Combined Neuroscience Institutional Review Board at the National Institutes of Health (NIH). All participants gave written informed consent after receiving a detailed explanation of the study.

All participants completed the Emotional Expression Multi-morph Task, the same task administered by Rich et al., 2008b, as well as a variation of the task created by Blair et al. (2001). Happy, sad, angry, disgusted, surprised, and fearful faces from Ekman and Friesen (1976) pictures of Facial Affect were used as the facial stimuli. The faces were displayed on a computer screen and slowly morphed through 39 iterations from neutral intensity (0%) to full emotional intensity (100%). Each iteration lasted 100 ms. Six different faces (three female) each displayed the six different emotions in random order for a total of 36 trials.

Participants were asked to watch the screen and inform the administrator as soon as they recognized the expression without merely guessing. The administrator then pressed a "stop" button that froze the face, and the subject selected the emotion from the six options listed at the bottom of the screen. The face then continued to morph through the remaining iterations. When the face reached 100% intensity, participants were asked to verify their response. Subjects could also change their answer at any point throughout the morph.

2.3. Statistics

The primary outcome measure was the morph level at which the subject identified the facial emotion; higher numbers indicated response to a stimulus with less emotional intensity. Three types of these measures were examined: the level at first response, correct response where incorrect items were listed as missing, and correct response where incorrect items were given one below the lowest possible value, or 0. The latter measure was included to understand whether results would change substantially with a type of censored outcome in cases where a correct response was not provided. An additional outcome measure was accuracy, as calculated by the percentage of correct responses.

Linear mixed models with compound symmetry covariance structures and restricted maximum likelihood estimation were used in full factorial models to examine the effects of diagnosis, emotion, and the trial number for each emotion. Only the fixed intercept was included in the models. Diagnoses included BPD, MDD, and control groups. Emotion (happy, sad, surprised, angry, disgusted, and fearful) and trial number (1–6) were within-subjects factors. Trial