The association between childhood trauma and facial emotion recognition in adults with bipolar disorder

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ABSTRACT

Many patients with bipolar disorder (BD) have difficulties in facial emotion recognition, which may also be impaired in maltreated children and in subjects who have a positive history of childhood traumatic experiences. Childhood trauma is reported with a high prevalence in BD and it is considered a risk factor for the disorder. As the relationship between facial emotion recognition and childhood trauma in BD has not yet been directly investigated, in this study we examined whether the presence of a childhood trauma in affectively stable BD patients was associated with poorer performance in emotion recognition. Seventy-five BD I and II participants completed the Childhood Trauma Questionnaire retrospectively assessing five types of childhood trauma (emotional, physical and sexual abuse, and emotional and physical neglect) and the Emotion Recognition Task evaluating the ability to correctly identify six basic facial emotions (happiness, sadness, anger, disgust, fear and surprise). Our results suggest that the presence of childhood trauma in participants with BD is associated with a more severe clinical presentation (earlier onset, longer duration of illness, and higher depressive symptom ratings) and that BD patients with a positive childhood history of emotional neglect perform worse than those without such a history in recognizing anger.

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1. Introduction

Emotion recognition is one of the subcomponents of the domain of social cognition and is often measured by assessing the ability to identify emotions based on facial expression (Ochsner, 2008). Data show that many patients with bipolar disorder (BD) have emotion recognition impairments (Kohler et al., 2011; Van Rheenen and Rossell, 2013). A meta-analysis by Kohler et al. (2011) including 51 studies revealed a moderately-sized deficit in identifying and discriminating facial emotions in participants with BD and major depression in comparison to healthy controls. This study suggested that the two diagnostic groups had a similar level of impairment in emotion identification and differentiation ($d = -49$ and $d = -46$ respectively), and that the same results held across a variety of emotion recognition tasks. Data suggest that deficits occur not only during the acute phases of the illness (Lembke and Ketter, 2002; Getz et al., 2003; Gray et al., 2006; Vederman et al., 2012), but also during symptom remission

(Bozikas et al., 2006). Although less severe than in schizophrenia (Addington and Addington 1998; Lee et al., 2013), deficits have been shown to be profound in patients with BD who are experiencing acute psychotic symptoms. In particular, these deficits were most pronounced in the identification of subtle expressions of happiness and sadness which persisted even after treatment with antipsychotic medication (Daros et al., 2014). Recent data indicate that psychotic spectrum disorder patients had lower emotion recognition accuracy compared to healthy controls, and that schizophrenia and schizoaffective disorder patients performed more poorly than psychotic bipolar patients (Ruocco et al., 2014). It also emerged that regardless of diagnostic group, recognition of neutral faces was the most difficult and that all the psychiatric groups had lower accuracy rates for angry faces than the healthy control group (Ruocco et al., 2014).

There are mixed findings about whether the impairments in emotion processing in patients with BD are global or if they are specific to particular emotions. Several studies have suggested that emotion processing impairments in BD are limited to certain emotions, although there is inconsistency regarding which specific emotions may be affected. Findings have been reported for sadness and fear (Derntl et al., 2009; Vederman et al., 2012), happiness (Lawlor-Savage et al., 2014), and surprise (Summers et al.,

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2006). Other data suggest a more generalized level of impairment that is not limited to specific emotions *per se* (Brotman et al., 2008; Van Rheenen and Rossell, 2014). A general facial emotion perception deficit was reported in a meta-analysis by Kohler et al. (2011), such that participants with BD or major depressive disorder demonstrated deficits in perceiving all six basic emotions (sadness, happiness, anger, disgust, fear and surprise) with effect sizes ranging from $d = -0.14$ (for disgust) up to $d = -0.50$ (for happiness) with no significant differences in the degree of processing impairment among the six emotions.

The presence of a deficit in emotion recognition in children with and at risk of developing BD (Guyer et al., 2007; Brotman et al., 2008) suggests that this deficit could be a potential endophenotype for the disorder. Brotman et al. (2008) compared facial emotion labeling errors between children with BD ($n=54$), children at risk for developing BD ($n=24$) and control subjects ($N=78$) and found that there were no significant differences in errors between children with BD and those at-risk for the disorder. Nevertheless, both groups made significantly more errors than comparison controls in identifying emotions in adult and child faces. Other data reported that facial emotion recognition deficits in psychotic patients are also present in their non-psychotic relatives: relatives of probands with schizophrenia, schizoaffective and BD recognized fewer facial emotions compared to healthy controls, and relatives of psychotic BD performed significantly better than schizophrenia relatives (Ruocco et al., 2014). Also, mirroring the performance of their probands unaffected relatives of all diagnostic groups had more difficulty than healthy controls recognizing neutral faces such that they were more likely to label an emotion when the faces were neutral (Ruocco et al., 2014).

Impairments in facial emotion processing occur not only in those with diagnosed psychiatric disorders, but may also occur in healthy children and adults with a history of childhood maltreatment (Pollak et al., 2000). In addition to an increased likelihood of developing anxiety and mood disorders, substance abuse and antisocial behavior in adulthood (MacMillan et al., 2001), maltreated children report difficulties in recognizing, expressing and understanding emotions (During and MacMahon, 1991). A recent prospective study (Young and Widom, 2014) investigating the long-term effect of child abuse and neglect on emotion processing demonstrated that adult subjects with a history of childhood maltreatment compared to those without such a history were less accurate in identifying emotions. Using a recognition task featuring positive, negative, and neutral stimuli from the International Affective Picture System (IAPS; Lang et al., 2008), the authors reported that physical abuse was associated with impaired accuracy for identifying neutral pictures; neglect and sexual abuse were associated with reduced accuracy for positive pictures. A study that used the Reading the Mind in the Eyes Test (RMET; Baron-Cohen et al., 2001), a somewhat more difficult task involving the recognition of more varied facial emotions (*i.e.* "joyful", "bored", "impatient") using only partial face stimuli, found impaired accuracy in maltreated children compared to non-maltreated children, specifically with regard to positive emotions (Koizumi and Takagishi, 2014).

Although data suggest that facial emotion recognition deficits appear to be a common phenomenon in BD patients as well as in people with adverse childhood experiences, the relationship between childhood trauma and facial emotion processing has not been systematically examined in patients with BD. It is important to understand how childhood trauma, which occurs with a very high frequency in patients with BD [approximately 50% (Garno et al., 2005)], may be related to the emotion processing deficits in patients with BD. Among patients with BD, childhood trauma is known to be associated with a worse clinical expression of the disorder, including an earlier illness onset, increased rapid cycling,

higher levels of impulsivity and rates of suicidal behaviors, more severe symptoms, and a higher number of comorbid psychiatric disorders including substance abuse (Leverich et al., 2002, Leverich and Post, 2006; Neria et al., 2005; Daruy-Filho et al., 2011; Etain et al., 2010, 2013; Aas et al., 2014). In addition, neurocognitive functioning (particularly verbal, visual recall memory, verbal fluency and cognitive flexibility) has been found to be negatively affected by the presence of childhood abuse (Savitz et al., 2008). We previously reported that childhood emotional abuse had a sex-specific effect on emotional decision-making [*i.e.* in the context of emotional abuse female participants with BD used a more conservative style than did the male counterpart (Russo et al., 2014)].

Given that emotion processing impairments may affect psychosocial functioning and quality of life of individuals suffering with BD (Green et al., 2007; Van Rheenen and Rossell, 2013), it is important to gain a better understanding of their potential correlates such as childhood traumatic events. In this study, we aimed to investigate the relationship between childhood trauma and facial emotion recognition in a sample of affectively stable BD patients. We hypothesize that BD patients with a history of childhood trauma will show larger deficits in emotion recognition compared to BD patients without a history of childhood trauma.

2. Methods

2.1. Participants

Data were derived from a sample of 75 participants with BD recruited through the community from the Icahn School of Medicine at Mount Sinai. To be included in the study, subjects needed to meet criteria for a diagnosis of BD I and II type. Diagnosis was ascertained using the Structured Clinical Interview for DSM-IV (SCID; First et al., 2002). Exclusion criteria for the study were: history of CNS trauma, neurological disorder, attention deficit hyperactivity disorder (ADHD) or a learning disorder (LD) diagnosed during childhood; history of electroconvulsive therapy in the previous 12 months; a diagnosis of substance abuse/dependence within the past 3 months; and any active or unstable medical problems. The Mount Sinai Institutional Review Board reviewed and approved all study procedures prior to commencement of the protocol and all participants provided written informed consent.

Of the 75 participants with BD, 51 were males (68.0%), the mean age was 47.1 years (SD= ± 10.2), and 20 (26.7%) were Caucasian. Fifty-three (70.7%) subjects had a diagnosis of BD type I and 22 of BD type II (29.3%); among the participants with BD type I, 24 (32.0%) had a history of psychosis *versus* 8 (10.7%) among those with BD type II. Subjects were affectively stable with a mean score for depression [as measured by the Hamilton Depression Rating Scale (HDRS; Hamilton, 1960) – 24 item version] of 7.3 (± 6.1) and a mania score [measured through the Young Mania Rating Scale (YMRS; Young et al., 1978)] of 3.2 (± 3.4). The mean duration of illness was 24.1 (± 11.4) years and the premorbid IQ [measured using the Wide Range Achievement Test-3rd edition-Reading subtest (WRAT-3; Wilkinson, 1993) was 97.8 (± 14.4; all above data are reported in Table 1).

2.2. Measures of childhood trauma and facial emotion recognition

The presence of childhood trauma was assessed with the Childhood Trauma Questionnaire (CTQ; Bernstein et al., 1997). The CTQ is a 28-item self-report questionnaire rating the frequency of certain experiences or feelings during childhood up to the age of 16, using a 5-point Likert scale ranging from 1 (never true) to 5 (very often true). The questionnaire investigates 5 different types of childhood trauma: emotional abuse, physical abuse, sexual abuse, emotional neglect and physical neglect. We determined whether a subject had a positive history of childhood trauma in a specific category based on different cutoff points previously described in the literature (Heim et al., 2009): 13 or higher for emotional abuse, 10 or higher for physical abuse, 8 or higher for sexual abuse, 15 or higher for emotional neglect, and 10 or higher for physical neglect.

The Emotion Recognition Task (ERT) as part of the Cambridge Neuropsychological Test Automated Battery (CANTAB; Robbins et al., 1994) is a computer-generated paradigm for the recognition of six basic facial emotional expressions: happiness, sadness, anger, disgust, fear, and surprise. The emotions (15 stimuli for each emotion with different levels of intensity) are mimicked by actors and presented randomly in two blocks (90 stimuli each). After each stimulus presentation (200 ms), the participant is asked to choose between the six emotional expressions displayed in labels on the screen. The task provides a percentage of correctness for each emotion and an overall mean of response latency.