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First rank symptoms & facial emotion recognition deficits in antipsychotic naïve schizophrenia: Implications for social threat perception model

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ABSTRACT

Facial emotion recognition deficits (FERD) have been consistently demonstrated in schizophrenia. However the relation between psychopathology and FERD remains inconclusive. This could possibly be due to the wide heterogeneity in the psychopathology of schizophrenia. First Rank Symptoms (FRS) of schizophrenia is associated with heightened sense of paranoia and rapid processing of threatful emotional stimuli. We studied differences in patterns of FERD between homogenous sub-groups of antipsychotic naïve schizophrenia patients ($n=63$); namely those experiencing FRS (FRS+ group $n=26$) and those who did not (FRS− group $n=37$), in comparison to age-, sex-, education matched healthy controls ($n=45$). FERD was assessed using TRENDS – (Tool for Recognition of Emotions in Neuropsychiatric DisorderS), a culturally sensitive and ecologically valid (consisting of both static and dynamic emotional stimuli) tool. The total number of images of non threatful emotions (sad, happy, neutral) which were identified as any of the threatful emotions (fear, anger, disgust) and vice versa were calculated and termed TRENDS Over-identification and Under-identification score respectively. The patient group made significantly greater errors in emotion recognition as compared to healthy controls. On post hoc analysis (Tukey HSD) the patients in FRS+ group made significantly greater errors in Over-identification as compared to the FRS− group. This study supports that FERD is one of the important deficits in schizophrenia. There is a differential pattern of impairment in FERD, which supports the role of heightened threat perception in the evolution of psychopathology in schizophrenia patients.

1. Introduction

Schizophrenia has been classically described to have positive, negative and cognitive symptom dimensions (Andreasen and Olsen, 1982; Klingberg et al., 2006). Recently, deficits in social cognition abilities; which include face perception, emotional processing, theory of mind & self-reference and working memory, are being increasingly realized (Grady and Keightley, 2002). These deficits are of clinical relevance as they can adversely impact the socio-occupational functioning of schizophrenia patients (Kee et al., 2003).

Facial Emotion Recognition Deficits (FERD) have been consistently demonstrated in schizophrenia and are found to be specific for negative emotions of fear, anger, and disgust (Kohler et al., 2000; Mandal et al., 1998; Van't Wout et al., 2007). Some of the previous studies on chronic schizophrenia patients did not find any correlation between FERD and psychopathology, indicating that they could be trait related deficits (Bediou et al., 2005a; Kucharska-Pietura et al., 2005). However, some other studies found a correlation between FERD and negative symptoms of alogia (Kohler et al., 2000) apathy and affective flattening (Martin et al., 2005) and also positive symptoms of hallucinations and delusions (Kohler et al., 2000; Mandal et al., 1999; Martin et al., 2005). In a recent study we have reported similar deficits in recognition of negative emotions in antipsychotic naïve schizophrenia patients, which correlated with the severity of negative symptoms(Behere et al., 2009). Most of these studies have focused on the performance accuracy on tasks of facial emotion recognition rather than the patterns of misidentification. Kohler et al (2003), in a study on error patterns in facial emotion recognition, found significant misattribution of neutral facial expressions in schizophrenia patients (Kohler et al., 2003). There was an over attribution to disgust and under attribution to happy expressions observed in this study. Tsoi et al (2008) in a study using signal detection analysis found that schizophrenia patients were more inclined to attribute any facial emotion as fearful or sad (Tsoi et al., 2008). Hence, evidence from studies till date indicate that FERD is consistently present in schizophrenia patients. However the relation

Abbreviations: FERD, Facial Emotion Recognition Deficits; FRS, First Rank Symptoms; SANS, scale for assessment of negative symptoms; SAPS, scale for assessment of positive symptoms; TRACS, TRENDS accuracy score; TRENDS, Tool for recognition of emotions in neuropsychiatric disorders.

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between psychopathology and FERD remains inconclusive. One of the possible reasons for this inconsistency could be the wide heterogeneity in the psychopathology of schizophrenia. Hence studying the patterns of emotion recognition deficits in homogenous patient subgroups, who experience similar psychopathology and may have similar patterns of processing of emotional stimuli; could give better understanding into the relation between FERD and psychopathology.

The First Rank Symptoms (FRS) of schizophrenia as described by Schneider are important to the psychopathology of schizophrenia. FRS deals with deficits in the ownership and agency of one's thoughts, emotions and actions (Frith et al., 2000). FRS, by their inherent nature are associated with an enhanced sense of paranoia and is experienced more commonly by patients of the paranoid subtype of schizophrenia. Paranoia has been described to be associated with enhanced threat perception and efficient identification of threatful facial emotional stimuli (anger). (Davis and Gibson, 2000; Kline et al., 1992) Hence patients experiencing FRS could form a homogenous subgroup of schizophrenia with a distinct pattern of emotion recognition deficits when compared with those schizophrenia patients who do not experience FRS.

The interpretations of the results of earlier studies on FERD and its association with psychopathology might be limited by the following factors. First, all the previous studies have examined antipsychotic-treated schizophrenia patients. The effect of antipsychotic treatment might contribute to variance in data which in turn could explain lack of significant differences in earlier studies. Processing of the various emotions has specific neurobiological substrates (Murphy et al., 2003) which may be differentially influenced by antipsychotic treatment. Interestingly, we have recently reported a short term follow up study which showed beneficial effect of antipsychotic (risperidone) treatment on the perception of the emotion of disgust (Behere et al., 2009). Secondly, most of the previous studies have used static facial emotional stimuli (i.e. photographs) to assess emotion recognition abilities. It has been demonstrated that dynamic emotional expression stimuli (i.e. video clips) are ecologically more valid and can comprehensively assess FERD (Elfenbein et al., 2002; Trautmann et al., 2009). Hence assessment of FERD using ecologically valid stimuli in homogenous sub groups of antipsychotic naïve schizophrenia patients could give greater insights into understanding the patterns of errors in identification of facial emotional stimuli and its relation to psychopathology.

In this study we aim to understand the patterns of emotion recognition in two groups of antipsychotic naïve schizophrenia (those who experience FRS and those who do not) in comparison to healthy control subjects, using a culturally sensitive, ecologically valid tool to study emotion recognition abilities. We hypothesized that patients with FRS would make greater errors in over-identification (i.e. they would misidentify non threatful emotions as threatful) and patients without FRS would make greater errors in under-identification (i.e. they would misidentify threatful emotions as non threatful).

2. Methods

2.1. Study subjects

Subjects included 63 antipsychotic-naïve schizophrenia (DSM-IV) patients recruited from the outpatient services of the National Institute of Mental Health and Neurosciences, Bangalore, India; and 45 age-, sex-, education-, matched healthy controls. All the patients were in the age range of 18–45 years and were assessed independently by two qualified psychiatrists and diagnosis ascertained according to the DSM IV criteria through independent clinical interview. Patients with prior exposure to neuroleptics, substance dependence in the last six months (except nicotine), and presence of co-morbid neurological or medical disorder were excluded from the study. The study sample was an extension of the sample reported in an earlier study by the authors (Behere et al; 2009).

Healthy controls ($n=45$) were recruited through 'word-of-mouth' from consenting volunteers. They were screened using Mini International Neuropsychiatric Interview – Plus (Sheehan et al., 1998) and comprehensive mental status examination, to rule out any psychiatric disorder. None of the controls had family history of psychiatric disorder in first-degree relatives. Written informed consent to participate in the study was obtained from all subjects. The study was approved by the ethics committee of the institute.

2.2. Procedure

Psychopathology in the patient group was assessed using the Scale for Assessment of Negative Symptoms (SANS (Andreasen, 1983) and Scale for Assessment of Positive Symptoms (SAPS) (Andreasen, 1984) with good inter-rater reliability (the intra-class correlation coefficient for SANS & SAPS were 0.92 and 0.98 respectively). FRS were identified by SAPS and were confirmed by comprehensive clinical interview and mental status examination, independently by two qualified psychiatrists, as per the definitions given by Mellor (Mellor, 1970). The FRS assessed included auditory hallucinations with voices conversing, voices commenting, thought echo, thought withdrawal, thought broadcast, thought insertion, made affect, made volition, made impulse, somatic passivity and delusional perception.

Facial emotion recognition abilities were assessed in all study subjects using the Tool for Recognition of Emotions in Neuropsychiatric DisorderS (TRENDS).

2.3. TRENDS

This is a culturally sensitive tool, developed by the authors and validated in the Indian population for studying FERD. Its development, validation and method of test administration have been reported earlier (Behere et al., 2008).

The tool consists of two arms – the static (still photographs) and the dynamic (videos) arm. Four trained actors (one young male, one young female, one older male and one older female) who had an experience of around ten years acting in theatre were chosen. They were asked to emote the six basic emotions of happy, sad, fear, anger, surprise and disgust at two different intensities high and low along with neutral facial expressions. The term intensity refers to degree of expression of the emotions. During acquisition of images, the actors displayed the emotions at two degrees of expressivity, namely – high and low (for example the two degrees of expressivity for the emotion of happy would be a smile and laugh). The still images captured each emotion at both degrees of expression and the dynamic or video images were captured at one degree. The different degrees of expression of emotions (i.e. high & low) for all emotions were independently concurred; by five qualified psychiatrists.

High resolution still photographs and video images were obtained. A three point lighting system was used to avoid any background shadows and enhance picture quality. All pictures were taken from a fixed distance of three feet. Dynamic images were edited using professional video editing software, in order to obtain four second video clips of each emotional expression. All dynamic images had emotions expressed in a single intensity but for the static images emotions were expressed at two different intensities. Hence a total of 52 static [4 posers × (6 low intensity emotion stimuli + 6 high intensity emotion stimuli + neutral] and 28 dynamic images [4 posers × (6 emotions + neutral)] were obtained. The images were then arranged in a random order using random number generator software and separate power point presentations were prepared for the static and dynamic images with the images appearing in the random order sequence. The tool was validated by 51 healthy volunteers and 5 qualified psychiatrists.

The images were viewed on a 15 in. computer monitor from a distance of 1 m in a closed room without any external distractions. The image size on screen was 1024 × 768 pixels. Images (not used in