Schizophrenia Research 143 (2013) 65–69

Contents lists available at SciVerse ScienceDirect

Schizophrenia Research

journal homepage: www.elsevier.com/locate/schres

Emotion recognition impairment is present early and is stable throughout the course of schizophrenia

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ARTICLE INFO

Article history:
Received 18 August 2012
Received in revised form 17 October 2012
Accepted 1 November 2012
Available online 4 December 2012

Keywords:
Facial emotion recognition
Psychosis risk syndrome
Schizophrenia
Social cognition
Psychosis prediction
Endophenotype

ABSTRACT

Individuals with schizophrenia experience problems in the perception of emotion throughout the course of the disorder. Few studies have addressed the progression of the deficit over time. The present investigation explores face emotion recognition (FER) performance throughout the course of schizophrenia. The aim of the study was to test the hypotheses that: 1) FER impairment was present in ultra high-risk (putatively prodromal) individuals, and that 2) impairment was stable across the course of the illness. Forty-three individuals with a putative prodromal syndrome, 50 patients with first episode of schizophrenia, 44 patients with multi-episode schizophrenia and 86 unaffected healthy control subjects were assessed to examine emotion recognition ability. ANCOVA analysis adjusted for possible confounder factors and subsequent planned contrasts with healthy controls was undertaken. The results revealed deficits in recognition of sadness and disgust in prodromal individuals, and of all negative emotions in both first-episode and multi-episode patients. Furthermore, there were no significant differences between clinical groups. Within the framework of the neurodevelopmental model of schizophrenia, our results suggest the presence of emotional recognition impairment before the onset of full-blown psychosis. Moreover, the deficit remains stable over the course of illness, fitting the pattern of a vulnerability indicator in contrast to an indicator of chronicity or severity.

1. Introduction

Facial emotion recognition (FER), or the ability to infer the emotional state of others, is essential to guide social functioning and behavior. Individuals with schizophrenia experience problems in the perception of emotions throughout the course of the disorder (Edwards et al., 2002; Kohler et al., 2010) and perform more poorly than bipolar patients (Addington and Addington, 1998). Emotion processing deficits in schizophrenia patients, assessed using facial emotion recognition tasks, are associated with lower concurrent community functioning (Kee et al., 2009), decreased levels of role (Eack et al., 2008) and social functioning (Addington et al., 2006), decreased ability to live independently and function at work (Kee et al., 2003), and decreased interpersonal skills (Pinkham and Penn, 2006). Rather than a general deficit that encompasses all emotions (Kucharska-Pietura et al., 2005), schizophrenia may be associated with a more specific deficit in the processing of a subset of negative emotions including anger, disgust, sadness and/or fear. Edwards et al. (2001) demonstrated deficits in the recognition of fear and sadness in individuals with first-episode psychosis assessed as outpatients during the recovery phase of illness. In the recent literature, FER impairment has been also documented in individuals who are "at risk" for psychosis (Addington et al., 2008), and specifically for negative emotions, i.e. fear and sadness (Amminger et al., 2012). These recent findings support the neurodevelopmental model of schizophrenia, which postulates that neuroanatomical abnormality and neuropsychological deficit may occur before the onset of illness. FER deficits in "at risk" individuals may serve as a marker of risk, whereas the trend over time of the deficit may help us to differentiate whether the deficit is a vulnerability or severity index.

The present study explores FER performance throughout the course of schizophrenia. The aim of the study was to test the hypotheses that: 1) FER impairment was present in ultra-high-risk (UHR; putatively prodromal) patients, and that 2) impairment was stable across the course of the illness. Moreover, we aimed to clarify the specificity of the deficit for negative emotion. To our knowledge, this is the first study exploring the ability in recognizing specific facial emotions throughout the course of schizophrenia, including a comparison among prodromal, first episode (FES) and multi-episode patients (MES). Confirmation of these hypotheses would provide new information on specific deficits in emotion perception in individuals with subthreshold manifestations of psychosis, as well as validate previous findings in FES and MES.

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http://dx.doi.org/10.1016/j.schres.2012.11.005

2. Material and methods

2.1. Subjects

We enrolled 208 male and female patients over the age of 18 years who were referred to our Acute Psychiatric Care Department or outpatient clinic. Forty-three patients met criteria for psychosis risk syndrome (McGlashan et al., 2010), i.e. Attenuated Psychotic Symptoms (APS), Brief Intermittent Psychotic Symptoms (BIPS) or functional decline and family history of schizophrenia (Genetic Risk and Deterioration, GRD). Ninety-four patients met a diagnosis of DSM-IV schizophrenia or schizophreniform disorder based on the Structured Interview for DSM-IV Disorders-I (SCID-I) (First et al., 1997). Within this group, 50 patients were experiencing their first psychotic episode, with very recent onset. Forty-four had an established diagnosis of schizophrenia with multiple-episode history. Exclusion criteria were (1) current or past comorbid diagnosis of autistic disorder or other pervasive developmental disorder, (2) history of severe head injury, (3) severe medical conditions or major neurological disorders, including mental retardation and dementia, which could prevent neuropsychological task performance or that could produce psychotic symptoms, and (4) any current drug abuse. Of the 208 subjects initially screened, 56 were excluded for current substance abuse and 15 presented severe medical conditions or neurological disease. UHR patients were not on antipsychotic medication, while FES and MES patients were receiving atypical antipsychotic medication at the time of assessment.

Eighty-six healthy volunteers were recruited as controls. None had prior history of psychiatric disease, mental retardation, neurological or general medical illnesses, including substance dependence, as determined by using an abbreviated version of the Comprehensive Assessment of Symptoms and History (CASH) (Andreasen et al., 1992). Controls were recruited according to specific socio-demographical characteristics to match each clinical group (UHR, FES and MES) based on age, gender, handedness and years of education. The absence of psychosis in first-degree relatives was confirmed by clinical records and family interview. All participants provided informed consent for participation in the study and publication of results.

The research was approved by the hospital's Ethics Committee.

2.2. Assessments

2.2.1. Psychopathology

Data on socio-demographic and psychopathological variables were collected at clinical interview. The prodromal sample was evaluated using the validated Italian version of the Scale of Prodromal Symptoms (SOPS) (Comparelli et al., 2011a). Mean SOPS positive score was 7.7 (SD = 4.3), mean SOPS negative score was 10.1 (SD = 6.5), mean SOPS disorganization score was 6.0 (SD = 3.1) and mean SOPS general score was 8.1 (SD = 4.1). The raters (A.C. and V.C.) are expert clinicians trained in the administration of the SIPS/SOPS. Cohen's κ for inter-rater reliability was 0.91 ($p<0.0001$). Psychopathology was rated through the Positive and Negative Syndrome Scale (PANSS) (Kay et al., 1987). For statistical analysis, we also used the depressive PANSS factor extracted by Lykouras et al. (2000) comprising items G2 (anxiety), G3 (guilt feelings) and G6 (depression). Current IQ was estimated through Raven's Standard Progressive Matrices (Raven, 2008).

2.2.2. Facial emotion recognition

To assess the ability to recognize emotions from facial expression, we used a specific FAR test for face recognition of six basic emotions (Comparelli et al., 2011b, 2012). Ekman and Friesen's (1975) facial emotion theory of six basic emotions (happiness, sadness, anger, fear, disgust and surprise), corresponding to six universally recognized facial expressions, is widely accepted.

Emotional expressions were reproduced by five actors (two women and three men) recorded on videotape. In order to improve the sensitivity of the test, we used a three-level expression grading (grading 1, grading 2, grading 3), corresponding to increasing level of difficulty of the recognition task. The grading was randomized in the same way for each clinical group and for all emotions. From the entire pool of colored photographs (10 × 12.5 cm; n = 5 actors × 6 emotions × 3 grading = 90 photographs), we chose those (n = 74 photographs) that yielded at least 75% inter-rater consistency among four independent non-participants.

Photographs of emotional faces and emotion labels were shown on a computer monitor to participants. Individuals were asked to select one of six emotions explicitly specified on the monitor for a given face (subtest A) or to select one of six faces that corresponded to the emotion displayed (subtest B). In subtest A, each participant had to recognize a given emotion seven times; a face referring to a given emotion appeared seven times during the test in random order. Each correct guess was scored as 1, so that the participant may score 0 to 42 on the test and 0–7 on each emotion. In subtest B, four different facial expressions were shown on the monitor each time along with one emotion label; the participant was requested to indicate which face expresses the emotion displayed on the video. Eighteen four-face sets were provided, three sets for each emotion, and each correct guess was given a score of 1, for a possible range of 0–18. There was no time limit for completion. No feedback was provided about accuracy of performance.

Both subtests measure emotional face recognition, but underlie different cognitive processing, as subtest A is a naming task (verbal modality), while subtest B is a recognition task (nonverbal modality).

2.3. Statistical analysis

For all clinical subgroups, we calculated means and standard deviations of demographic, psychopathological (PANSS), IQ and FER measures. We analyzed differences in socio-demographic, IQ, clinical features, and FER performance among the three clinical subgroups (UHR, FES, MES) and the healthy control group using one-way ANOVA and post-hoc analysis according to Bonferroni or Tahmane after controlling for homogeneity of variance. To evaluate the possible confounding role of depressive symptoms, we also carried out a one-way ANOVA analysis with the Depressive PANSS factor. A student's T-test was used to compare differences in antipsychotic dosages in FES and MES. Subsequent ANCOVA with adjustments for socio-demographic and clinical variables that differed significantly among groups according to the one-way ANOVA analysis was applied to compare the number of correct emotion answers in the UHR, FES, MES and healthy control groups. Planned simple comparisons were made for each of the UHR, FES and MES groups to the control group. We calculated effect sizes by dividing the adjusted mean difference for the group of interest by the pooled standard deviation of all groups. Cohen (1988) defined effect sizes as "small = 0.2," "medium = 0.5," and "large = 0.8". A significance level of 0.05 was used for all statistical tests, and two-tailed tests were applied. Tests were carried out with the statistical package SPSS (version 17.0.2).

3. Results

Socio-demographic characteristics, psychopathology and FER performance in the different groups are shown in Table 1. There was a statistically significant difference for sex, with a lower proportion of males in the UHR group; $p<0.001$. Considering pharmacological treatment, according to Gardner et al. (2010), mean daily dose for antipsychotic medication in olanzapine equivalents was 18.2 mg (DS = 0.5) in recent onset psychosis and 17.8 mg (DS = 0.6) in chronic psychosis, with no significant difference between the two dosages (T 2.41, df = 92, $p>0.05$).

In the entire sample, ANOVA one-way comparisons showed significant differences between groups. As expected, the groups differed for age ($p<0.001$), as the MES group was significantly older than the other two clinical groups (UHR and FES). Duration of illness in MES