Schizophrenia Research 161 (2015) 322–328

Contents lists available at ScienceDirect

Schizophrenia Research

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

Emotion recognition in unaffected first-degree relatives of individuals with first-episode schizophrenia

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ARTICLE INFO

Article history:
Received 11 August 2014
Received in revised form 30 November 2014
Accepted 6 December 2014
Available online 19 December 2014

Keywords:
Fear
Emotion recognition
Schizophrenia
Heritability
First-degree relatives
Endophenotype

ABSTRACT

Objective: Impairments in recognising negative emotions are found in individuals with first-episode and chronic schizophrenia and also in those at ultra-high risk for the illness. Whether these impairments are an endophenotype for schizophrenia is unclear. To examine the heritability of emotion recognition, the aim of this study was to examine whether facial and prosody emotion recognition deficits, particularly for negative emotions, are also present in unaffected first-degree relatives of people with schizophrenia.
Methods: Face and prosody emotion recognition (ER) were examined in individuals with first-episode schizophrenia ($n = 30$), their unaffected first-degree relatives ($n = 27$) and healthy controls ($n = 30$). Measures of psychopathology and IQ were also administered.
Results: On the face ER task, first-episode schizophrenia participants performed significantly more poorly in recognising anger ($p = .017$), disgust ($p = .033$) and fear ($p = .040$) and first-degree relatives were significantly poorer at recognising fear ($p = .003$) than healthy controls. On the prosody ER task, first-episode schizophrenia participants made significantly more errors in recognising anger ($p = .001$) and surprise ($p = .003$) and first-degree relatives were significantly poorer at recognising anger ($p = .005$) than healthy controls. Effect sizes were medium to large. After controlling for age, IQ and symptoms, both unaffected first-degree relatives and first-episode schizophrenia patients displayed a significant deficit in facial fear recognition relative to healthy controls ($p = .040$ and $p = .048$, respectively). This deficit was not associated with current psychiatric symptoms.
Conclusions: These findings bolster evidence for emotion recognition (particularly for fear) as a heritable characteristic of schizophrenia. However, the diagnostic specificity of this finding requires further investigation.

1. Introduction

Emotion recognition (ER), particularly of negative emotions, is found to be impaired in chronic schizophrenia (Bellack et al., 1992; Bell et al., 1997; Kohler et al., 2003; Bediou et al., 2005; Pijnenborg et al., 2007; van't Wout et al., 2007; Leppanen et al., 2008; Fett et al., 2012), first-episode schizophrenia (Edwards et al., 2001; Amminger et al., 2012b; Comparelli et al., 2013), and in individuals at ultra-high risk (UHR) for developing a psychotic disorder (Amminger et al., 2012b; Comparelli et al., 2013). These ER deficits have been observed in both facial and prosodic modalities (Edwards et al., 2001; Pijnenborg et al., 2007; Amminger et al., 2012a). This apparent stable, state-independent bi-modal impairment suggests that ER may be a vulnerability marker or endophenotype of schizophrenia (Comparelli et al., 2013). Apart from being clearly associated with the illness and present during remission, the criteria for an endophenotype include that it is heritable and more frequently present in unaffected relatives than in the general population, while still being more frequently present in the affected than unaffected family members (Gottesman and Gould, 2003). The evidence regarding the heritability of disturbed ER, investigated in studies of unaffected first-degree relatives (FDR) of people with schizophrenia is highly inconsistent, with some studies finding significant ER deficits in unaffected FDR compared to healthy controls (McCown et al., 1988; Kee et al., 2004; Bediou et al., 2007; Leppanen et al., 2008; de Achaval et al., 2010; Eack et al., 2010; Li et al., 2010), and others finding no ER impairment in FDR (Toomey et al., 1999; Bolte and Poustka, 2003; Goghari et al., 2011; Fett et al., 2012; Li et al., 2012; Tucker et al., 2013). Several reasons may account for these inconsistent findings. The first is the large variability in the FDR samples

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http://dx.doi.org/10.1016/j.schres.2014.12.010
0920-9964/

recruited to each study, including siblings (Kee et al., 2004; Bediou et al., 2007; Leppanen et al., 2008; Fett et al., 2012; Li et al., 2012), parents (McCown et al., 1988), or a mixture of FDR including offspring and second-degree relatives (Toomey et al., 1999; de Achaval et al., 2010; Eack et al., 2010; Tucker et al., 2013). Second, studies have used diverse ER measures, making direct comparisons problematic, and only two studies have examined prosody ER in FDR (Kee et al., 2004; Tucker et al., 2013). Perhaps more importantly, only some studies examined whether emotion-specific ER deficits were present in FDR (Bediou et al., 2007; Leppanen et al., 2008; Eack et al., 2010; Fett et al., 2012; Tucker et al., 2013). Compared to healthy controls, two studies have found that siblings had impaired recognition of disgust and fear (Bediou et al., 2007) and anger (Leppanen et al., 2008). One study found a deficit in neutral affect recognition in FDR, but did not examine recognition of the other emotions (Eack et al., 2010). Contrastingly, in the largest study conducted to date (Fett et al., 2012), ER for happy, angry, fearful and neutral faces in siblings ($n = 943$) was not significantly different from healthy controls ($n = 542$). Several of the FDR studies did not examine recognition of neutral affect (Kee et al., 2004; Bediou et al., 2007; Leppanen et al., 2008; Li et al., 2010). We recently found that ER performance in UHR individuals was predictive of transition to a psychotic disorder within 12 months (Allott et al., 2014). However, rather than deficits in recognition of negative emotions, poorer recognition of neutral affect and better identification of fear significantly predicted transition, highlighting the importance of examining all emotions including neutral affect in order to characterise ER as an endophenotype for schizophrenia.

In light of the inconsistent findings in FDR studies and our previous findings using the same ER tasks indicating differences between 1) the ER deficits observed in UHR and schizophrenia (Amminger et al., 2012b) and 2) the ER predictors of psychotic disorder transition (Allott et al., 2014), the aim of this study was to examine facial and prosody ER in participants with first-episode schizophrenia (FES), their unaffected first-degree relatives (FDR), and healthy controls (HC). Importantly, the ER measures used were the same as in previous studies (Edwards et al., 2001; Amminger et al., 2012a, 2012b; Allott et al., 2014). In line with the theory that ER for negative emotions may be an endophenotype, we hypothesised that unaffected FDR and FES participants would perform more poorly than HC in their recognition of negative emotions, especially fear and sadness in faces and anger in voices, as found in our previous UHR study (Amminger et al., 2012b). We also hypothesised that if ER deficits were present they would not be associated with symptoms in the FES group, providing further evidence as endophenotypic markers.

2. Methods

2.1. Participants

The participants were 30 individuals with first-episode schizophrenia (FES), 27 first-degree relatives (FDR) and 30 healthy controls (HC). Data on the FES and HC participants has been reported in previous studies (Amminger et al., 2012a, 2012b). The FES group comprised individuals aged 12–19 years who met diagnosis for a first-episode of schizophrenia based on assessment using the Structured Clinical Interview for DSM-IV (SCID-P) (First et al., 2001). The FDR group comprised 14 siblings (5 males, 9 females) who were aged 12–30 years ($M = 19.02$, $SD = 5.41$), and 13 parents (5 males, 8 females) who were aged 33–62 years ($M = 46.99$, $SD = 8.66$). There were 11 family units and 3 individuals in the FDR group; 8 of the 11 family units were related to one of the FES participants and 3 of the family units had a family member with FES who was not included in the study. More specifically, 17 of the 27 FDR participants had a relative in the FES group. Of the 8 families who were related to the FES participants, 4 had 3 members ($n = 12$), 1 had 2 members ($n = 2$) and 3 had 1 member ($n = 3$). Of the 3 families that did not have a relative in the FES group, 1 had 3 members ($n = 3$) and 2 had 2 members ($n = 4$). There were no instances of psychosis in the FDR group, which was confirmed using the SCID-P (First et al., 2001). The HC group was recruited from among the FES participants' friends and schools and ranged in age from 12 to 20 years old. Two HCs were siblings and one was a cousin of the two siblings ($n = 3$); the remaining healthy controls ($n = 27$) were not related.

Study exclusion criteria for all groups included significant impaired vision (i.e., blurred or less than 20/20 vision with correction), impaired auditory acuity, acute intoxication, pervasive developmental disorder, mental disorder secondary to a general medical condition, intellectual disability defined as an IQ less than 70, or the presence of any documented neurological condition.

2.2. Procedure

Approval was granted by the Ethics Committee of the Medical University of Vienna. All participants provided written informed consent, including parental consent for those less than 18 years of age. All FES participants were consecutive admissions to a specialised psychosis detection and treatment unit at the Department of Child and Adolescent Psychiatry, Medical University of Vienna, Austria, between May 2003 and May 2006. The FES group were assessed as outpatients during the early recovery phase of illness. Individuals were generally assessed 6 weeks to 6 months following the resolution of the acute phase of illness when their mental state was stabilised. The judgement of stabilisation was clinically determined. Following Edwards et al. (2001), the aim was to maximise participation of all patients at an optimal recovery point, within 6 months of the resolution of the acute psychotic phase. Healthy controls underwent the same assessment procedure as the FES and FDR groups as detailed below.

2.3. Measures

2.3.1. Psychopathology

The Positive and Negative Syndrome Scale (PANSS) (Kay et al., 1987) was used to assess psychiatric symptoms. PANSS ratings were made by experienced clinicians with training in the administration of the scale. Inter-rater reliability estimates for PANSS subscales were excellent (all intra-class correlation coefficients >0.92). To maintain reliability between raters, videotaped interviews were used approximately every 3 months across the entire study period to avoid rater drift. The SCID-P for DSM-IV (First et al., 2001) was used to ascertain psychiatric diagnoses.

2.3.2. Emotion recognition

Facial and prosody emotion recognition assessments were undertaken. We chose to administer the emotion recognition assessments used by Edwards et al. (2001) as this is one of the key studies of emotion recognition in early psychosis and we had also administered this task in UHR (Amminger et al., 2012b). We wanted to ensure consistency across studies so that our findings could be directly comparable. Detailed descriptions of the administration are described in detail elsewhere (Amminger et al., 2012b; Allott et al., 2014). In brief, the facial emotion-labelling task comprised 21 slides from 110 slides of Ekman and Friesen's (1976) standardised photographed faces representing sadness, anger, happiness, disgust, surprise, fear, and neutral. The prosody emotion recognition task (Edwards et al., 2001) included 16 simple sentences (e.g., “they must stay here”; “he will come soon”; “she will drive fast”; “we must go there”) spoken in different moods. There were a total of 60 prosody items across the five emotion categories of fear, sadness, anger, surprise, and neutral. A multiple-choice response format was used in both ER tasks, with scores calculated as percentage correct.