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Emotion recognition as a predictor of transition to a psychotic disorder in ultra-high risk participants

Kelly A. Allott [a,*], Miriam R. Schäfer [a,b], Andrew Thompson [a,c], Barnaby Nelson [a], Sarah Bendall [a], Cali F. Bartholomeusz [d], Hok Pan Yuen [a], Patrick D. McGorry [a], Monika Schlögelhofer [b], Andreas Bechdolf [a,e], G. Paul Amminger [a,b]

[a] Orygen Youth Health Research Centre, Centre for Youth Mental Health, The University of Melbourne, Australia
[b] Department of Child and Adolescent Psychiatry, Medical University Vienna, Austria
[c] East Sussex Early Intervention in Psychosis Service, Sussex Partnership NHS Foundation Trust, United Kingdom
[d] Melbourne Neuropsychiatry Centre, The University of Melbourne, Australia
[e] Department of Psychiatry and Psychotherapy, University of Cologne, Germany

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ABSTRACT

Aims: Recent research has shown emotion recognition to be impaired in individuals at ultra-high risk (UHR) for developing a psychotic disorder compared to healthy controls. This longitudinal study aimed to examine whether disturbed emotion recognition measured in UHR participants at baseline predicts transition to a psychotic disorder within 12 months.

Methods: Thirty-seven UHR participants aged 13–22 years participated in the study. At baseline participants completed face and prosody emotion recognition tasks, as well as measures of psychopathology, functioning, and IQ. Transition to a psychotic disorder over 12 months was the primary outcome. A series of Cox regressions was performed with emotion recognition as the predictor variable, while controlling for covariates, with time to transition to a psychotic disorder as the dependent variable.

Results: Eleven (29.7%) of the 37 participants transitioned to a psychotic disorder over the 12-month follow-up period. Total face or prosody emotion recognition accuracy was not predictive of transition to a psychotic disorder. However, examination of recognition of specific emotions, while controlling for positive, negative and global symptoms and functioning, revealed that accuracy in identifying neutral ($p = .037$) and fearful ($p = .015$) emotion predicted transition to a psychotic disorder. Specifically, lower accuracy in identifying neutral emotion and higher accuracy in identifying fearful emotion were predictive of transition to a psychotic disorder within 12 months. Examination of the separate modalities revealed that this finding held for face but not for prosody emotion recognition.

Conclusion: These findings suggest that emotion recognition abilities may be prognostic for the development of psychotic disorders, but further studies are needed.

1. Introduction

The neurodevelopmental hypothesis proposes that the etiology of schizophrenia involves abnormal brain development resulting from genetic and environmental influences (Marenco and Weinberger, 2000). Central to this theory is the notion that neurological, cognitive and behavioral deficits are likely to emerge during childhood and/or adolescence and precede full-threshold psychotic disorder. Accordingly, research in individuals deemed to be at clinical high-risk (CHR) for a psychotic disorder aims to identify neurobehavioral markers that may be predictive of psychosis onset, provide insight into the pathogenesis of psychosis, and offer potential targets for preventive treatments. Regarding cognition, most studies to date have examined neurocognition (Brewer et al., 2006). However, social cognition, a related but independent construct, has received markedly increased attention in recent years (Green and Phillips, 2004; Thompson et al., 2011). In particular, the domain of emotion recognition has been extensively studied (Couture et al., 2006; Kohler et al., 2010).

Interpersonal encounters involve the perception, decoding and response to emotive cues (Green and Phillips, 2004). One's ability to accurately decipher and integrate these cues with other relevant social information influences social competence (Couture et al., 2006). Stable and significant deficits in facial and prosody emotion recognition have been demonstrated in first-episode and chronic schizophrenia samples (Edwards et al., 2002; Kucharska-Pietura et al., 2005; Kohler et al., 2010; Green et al., 2012) and are associated with poorer social functioning (Irani et al., 2012). Although longitudinal studies are limited, these findings tend to suggest that emotion recognition abnormalities might

* Corresponding author at: Orygen Youth Health Research Centre, 35 Poplar Road, Parkville, Victoria 3052, Australia. Tel.: +61 3 9342 2942; fax: +61 3 9342 2858.
E-mail address: kallott@unimelb.edu.au (K.A. Allott).

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represent a trait marker (as opposed to state marker/symptom) of psychotic disorders.

Supporting evidence for this premise comes from studies demonstrating that emotion recognition deficits are also present in CHR or ultra-high risk (UHR) for psychosis populations (Addington et al., 2008; van Rijn et al., 2011; Amminger et al., 2012a,c; Green et al., 2012). On a facial emotion recognition task, Addington et al. (2008) found that CHR individuals performed significantly worse than healthy controls and their performance was not significantly different from first- and multiple-episode psychosis patients. Green et al. (2012) also found poorer emotion identification in CHR individuals versus healthy controls, but their performance was significantly better than recent-onset and chronic psychosis patients. In adolescent UHR individuals, van Rijn et al. (2011) found impaired labeling of neutral faces relative to healthy controls, with a tendency for UHR participants to misattribute neutral faces as angry. We recently examined emotion recognition for faces and voices in UHR individuals and found impairments across both sensory modalities (Amminger et al., 2012b). Specifically, the ability to recognize fear and sadness (modalities combined) was significantly poorer in UHR individuals than healthy controls, and these deficits were of similar severity as those with first-episode schizophrenia (Amminger et al., 2012b). Specific examination of facial emotion recognition revealed the same pattern of results; however, in voices only recognition of anger was impaired in both clinical groups.

Several studies have also reported significant emotion recognition deficits in unaffected first-degree relatives of individuals with schizophrenia-spectrum disorders (Kee et al., 2004; Bediou et al., 2007; Eack et al., 2010). Although Eack et al. (2010) found no significant difference in total emotion recognition scores between unaffected family members and healthy controls, analysis of specific emotions revealed a significant deficit in labeling neutral faces in the unaffected family members, with a tendency to label neutral emotions negatively.

Collectively, results of these studies suggest that emotion recognition may represent a trait marker of psychotic disorders. However, findings of cross-sectional high-risk studies are diluted by the fact that most individuals in these cohorts do not go on to develop a psychotic disorder (Yung et al., 2007) and emotion recognition abnormalities are observed in other psychiatric disorders (Derntl et al., 2009; Demenescu et al., 2010; Kohler et al., 2011). Thus, it is possible that emotion recognition abnormalities are simply epiphenomena or trait markers of general psychopathology. Stronger evidence would come from longitudinal prospective studies that examine whether emotion recognition is predictive of transition to a psychotic disorder. Pinkham et al. (2007) reported similar facial emotion recognition performance in a sample of at-risk individuals who transitioned to a psychotic disorder ($n = 5$) within 12 months versus those who did not ($n = 14$), suggesting that emotion recognition may not be predictive of transition. However, significance testing was not performed due to the small sample. Addington et al. (2012) examined face and prosody emotion recognition in a large longitudinal study of CHR individuals. They found no difference between the baseline emotion recognition scores of participants who transitioned ($n = 25$) and those who did not transition to a psychotic disorder over 2 years ($n = 121$); but more than half (65%) of the original sample was not followed-up (for various reasons), significantly limiting the conclusions that could be drawn. Furthermore, results of the predictive value of individual emotions were not reported and the effect of time to follow-up was not accounted for in the analysis.

The current longitudinal study aimed to examine whether baseline emotion recognition predicts transition to a psychotic disorder over 12 months in UHR individuals. In accordance with findings in schizophrenia and first-episode psychosis, we first hypothesized that poorer total face and total prosody emotion recognition would be predictive of transition to a psychotic disorder. Second, based on our previous findings (Amminger et al., 2012b), we predicted that deficits in recognizing the specific emotions of anger, fear and sadness would be predictive of transition. Third, in accordance with other recent literature highlighting the significance of neutral emotion recognition (Eack et al., 2010; van Rijn et al., 2011), we hypothesized that misattribution of neutral emotion would be predictive of transition to a psychotic disorder.

2. Methods

2.1. Sample

The sample was derived from the 40 UHR participants assigned to the placebo treatment arm of a randomized controlled trial that examined whether long-chain omega-3 polyunsaturated fatty acids could prevent the onset of psychotic disorder, described elsewhere (Amminger et al., 2010). Similar to a previous analysis concerned with the prediction of psychosis from this trial (Amminger et al., 2012b), only the participants who received placebo were included in the present investigation because the transition rates differed significantly between the two treatment groups (Amminger et al., 2010). One additional participant assigned to the omega-3 group who mistakenly received placebo was also included in the current study. Of the 41 included participants, two had no follow-up data and two did not complete the emotion recognition measures. Thus, complete data at baseline and follow-up were available for 37 (90.2%) participants.

The study was conducted at the psychosis detection and treatment unit of the Department of Child and Adolescent Psychiatry, Medical University Vienna (May 2004–May 2007). Participants were eligible if they were aged 13–25 years and met criteria for one or more of three operationally-defined UHR groups (Yung et al., 1998): attenuated positive psychotic symptoms (group 1); transient psychosis (group 2); or genetic risk plus decreased functioning (group 3). The presence of attenuated or transient psychotic symptoms was determined with the Positive and Negative Syndrome Scale (PANSS; Kay et al., 1987) using validated symptom severity, frequency and duration criteria (Yung et al., 1998; Morrison et al., 2004). The third group comprised individuals with a first-degree relative with a history of psychotic disorder (Andreasen et al., 1977) or having a DSM-IV schizotypal personality disorder and a $\geq$30% decrease in functioning on the Global Assessment of Functioning (GAF) scale. Participants were assessed by two psychiatrists within 1 week of initial presentation and were antipsychotic-naïve at baseline and throughout the 12-month follow-up unless they developed a psychotic disorder during this time.

Exclusion criteria were: impaired vision (blurred or <20/20 with correction); impaired auditory acuity; organic mental disorder; IQ < 70; or neurological disorder. The study was approved by the Ethics Committee of the Medical University of Vienna. All participants provided written informed consent, including parental consent for those <18 years of age.

2.2. Measures

2.2.1. Transition to a psychotic disorder

The primary outcome was transition to a psychotic disorder within 12 months, defined as a PANSS score of $\geq$4 on hallucinations or delusions, or $\geq$5 on conceptual disorganization, maintained for $\geq$1 week (Yung et al., 1998; Morrison et al., 2004). Transition was independently confirmed by psychiatrists not associated with the study. The Structured Clinical Interview for DSM-IV-TR Axis I Disorders (First et al., 2001) was used to determine psychiatric diagnoses, including major depressive disorder (MDD) and anxiety disorders. Further details of the follow-up process and monitoring for transition is described elsewhere (Amminger et al., 2010).

2.2.2. Emotion recognition

Face and voice (prosody) emotion recognition was examined at baseline. The facial emotion recognition task was a computerized modification of Feinberg et al.'s (1986) procedure. Stimuli consisted of 21 slides of photographs of faces, each posing one of seven emotions: