



Contents lists available at ScienceDirect

Schizophrenia Research

journal homepage: [www.elsevier.com/locate/schres](http://www.elsevier.com/locate/schres)

## Emotional intelligence in non-psychotic first-degree relatives of people with schizophrenia

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### ARTICLE INFO

#### Article history:

Received 23 October 2015

Received in revised form 19 April 2016

Accepted 25 April 2016

Available online xxxx

#### Keywords:

Emotional intelligence

Schizophrenia

First-degree relatives

MSCEIT

Social cognition

Schizotypy

### ABSTRACT

Subtle social cognitive deficits in unaffected relatives of schizophrenia patients have received increasing attention over the last few years, supporting their potential endophenotypic role for this disorder. The current study assessed non-psychotic first-degree relatives' performance on a multidimensional measure of emotional intelligence (EI): the Mayer–Salovey–Caruso Emotional Intelligence Test 2.0 (MSCEIT). Endorsed by the National Institute of Mental Health, the MSCEIT is a valid and reliable instrument for detecting emotion-processing deficits among schizophrenia patients and people high in schizotypy. *Method:* Thirty-seven first-degree relatives, 37 schizophrenia outpatients and 37 healthy controls completed the MSCEIT, which comprises eight subscales aimed to assess the four branches of EI: Identifying, Facilitating, Understanding and Managing Emotions. Potential associations with cognitive function and schizotypy levels, measured with the Schizotypal Personality Questionnaire–Brief, were further evaluated. *Results:* Relatives had significantly lower MSCEIT total scores than controls and also significantly lower scores on the Identifying emotions branch. Nevertheless, schizophrenia patients still had the poorest global EI performance. The strongest positive correlations were found in relatives and controls with measures of executive function, processing speed and general intelligence. A higher level of schizotypy correlated significantly with lower MSCEIT scores among controls, but not among relatives. *Conclusions:* Contrary to expectations in the general population, the current study observed subtle EI impairment in non-psychotic first-degree relatives of schizophrenia patients. These findings support the hypothesis that these EI deficiencies may be potential endophenotypes located between the clinical phenotype and the genetic predisposition for schizophrenia.

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### 1. Introduction

Social cognition embraces a wide range of skills such as perceiving, interpreting and processing social stimuli essential for adequate social functioning and interpersonal success (Green et al., 2008). In schizophrenia, impairment in this area has been widely reported, including deficits in mentalizing (Sprong et al., 2007), attributional bias (Lee et al., 2004), social perception (Toomey et al., 2002) and emotion processing (Edwards et al., 2002). These deficits are acknowledged as clinically important features of schizophrenia (Penn et al., 2006), and have been reported to significantly interfere in patients' daily functions

(Couture et al., 2006; Fett et al., 2011). They emerge in the early stages of the disorder and settle into a stable pattern over time (Addington et al., 2006; Cuesta et al., 2015; Sprong et al., 2007); they are related (albeit not consistently) with certain clinical symptoms of the illness (Edwards et al., 2002; Sergi et al., 2007).

Emotion processing is one of the most extensively studied social cognition deficits in schizophrenia. Of the broad set of domains that make up the concept, research has focused mainly on the study of emotion perception and has shown a notably inferior performance in these patients (Couture et al., 2006; Green et al., 2008; Kee et al., 2003). However, theoretical models and instruments that properly assess components of emotion processing in its entirety are lacking (Kee et al., 2009). The research community has responded to this limitation by developing new frameworks of study, among which the Four-Branch Model of Emotional Intelligence, developed by Mayer and Salovey (1997), is currently one of the most influential.

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The Four-Branch Model centers on the study of Emotional Intelligence (EI). As an important component of social cognition, EI reflects the capacity to reason about one's own emotions and those of others, and to use emotion to facilitate thinking (Mayer et al., 2002). EI encompasses four emotion-processing abilities – Identifying, Facilitating, Understanding and Managing emotions – which are positively correlated with measures of general intelligence (Mayer et al., 2002), social engagement, and quality of life (Lopes et al., 2005). Indeed, the confluence of multiple factors interacting in complex and dynamic ways – including genetic, temperamental and environmental variables – has been proposed as a determinant of EI, although the results of research on this subject are still not conclusive (Zeidner et al., 2002).

To properly evaluate this model, Mayer et al. (2002) designed the Mayer–Salovey–Caruso Emotional Intelligence Test 2.0 (MSCEIT), a multidimensional instrument with widely proven validity and reliability in the general population (Mayer et al., 2003).

In the context of schizophrenia, previous studies using the MSCEIT have reported an overall impairment in EI and its multiple domains (Dawson et al., 2012; Eack et al., 2010a; Frajo-Apor et al., 2016; Kee et al., 2009). These deficits correlated positively with impaired verbal fluency capacity (Dawson et al., 2012) and general cognitive dysfunction (Eack et al., 2010a). To date, the MSCEIT has not been used to study the estimated heritability of EI deficits in schizophrenia; however, previous research found a significant estimated heritability of 0.373 for emotion identification efficiency (a skill included in the Four-Branch Model of EI, Gur et al., 2007) as well as for other neurocognitive deficits in this disorder (Bertisch et al., 2010).

Thanks to its widely demonstrated validity and reliability as a social cognition measure in schizophrenia, the MSCEIT was selected by the NIMH to represent the domain of social cognition in the MATRICS (Measurement and Treatment Research to Improve Cognition in Schizophrenia) Consensus Cognitive Battery (MCCB) (Green and Nuechterlein, 2004; Green et al., 2005).

Interestingly, the MSCEIT has also obtained similar results among individuals high in schizotypy, including general EI impairment and deficits in the Identifying and Managing emotions branches (Aguirre et al., 2008). These authors suggest that the deficiencies might represent a trait of the disorder, possibly related to a genetic vulnerability to the pathology, rather than a transient state.

The study of subtle social cognitive impairment in unaffected relatives of patients with schizophrenia has also increased significantly in recent years. The studies performed have aimed to test whether these deficits might be potential endophenotypes linking the clinical phenotype with the genetic predisposition for schizophrenia, which might help to identify rational targets for new treatments in the future (Sitskoorn et al., 2004). However, few studies have examined this issue to date, and their results have been inconsistent: while some groups have reported a global social cognition impairment in first-degree relatives compared to healthy controls (Alfimova et al., 2009; Bediou et al., 2007; Eack et al., 2010b; Janssen et al., 2003; Lavoie et al., 2013), others have reported no differences at all (Kelemen et al., 2004; Loughland, 2004). Experts in this field have attributed these inconsistent findings to the methodological heterogeneity in study designs (Lavoie et al., 2013).

Although the MSCEIT is a well-validated measure both in schizophrenia and individuals high in schizotypy, it has not yet been administered to unaffected relatives of people with schizophrenia. The exploratory study we present here reports the use of the MSCEIT multidimensional measure to assess EI in a sample of non-psychotic first-degree relatives of schizophrenia patients. Potential associations with neurocognitive function and level of schizotypy will also be evaluated. Our main hypothesis is that the group of relatives will obtain significantly lower scores on all MSCEIT measures than the healthy controls, but higher scores than the schizophrenia patients.

## 2. Materials and methods

### 2.1. Participants

Thirty-seven non-psychotic first-degree relatives of people with schizophrenia, 37 outpatients with schizophrenia and 37 healthy controls, all fluent in Spanish and between 19 and 66 years of age, were included from the outpatient service of the Psychiatry Department of Bellvitge University Hospital, the Polyvalent Mental Health Unit and the Mental Health Unit of L'Hospitalet de Llobregat.

First-degree relatives, including 15 parents, 17 siblings and 5 offspring were sampled at the collaborator units. The relatives did not meet criteria for any Axis I or Axis II (DSM-IV-TR; American Psychiatric Association, 2000), except for two siblings with previous diagnoses (one Attention Deficit Hyperactivity Disorder and the other Cocaine Abuse disorder). After discussion, the researchers decided to include these individuals since they were clinically stable and fully asymptomatic at the time of the study.

All schizophrenia patients met DSM-IV-TR criteria (American Psychiatric Association, 2000), were in remission sensu Andreasen et al. (2005) and had not undergone electroconvulsive therapy in the last six months. Participants with other Axis I disorders were excluded.

Healthy control subjects were recruited from hospital employees and had no a history of personal or family psychiatric illness, including both Axis I and II disorders.

All potential participants underwent an evaluation prior to inclusion in which mental and personality disorders were assessed using the structured clinical interview for DSM-IV Axis I Disorders (SCID-I; First et al., 1997) and Axis II Personality Disorders (SCID-II; First et al., 1994). Exclusion criteria were a history of head trauma with loss of consciousness, organic disease with mental repercussions or an estimated Intelligence Quotient (IQ) score below 70. Groups were matched for gender, age and educational level. The Clinical Research Ethics Committee of the institution approved all study procedures. All subjects gave signed informed consent before entering the study.

### 2.2. Measures and procedures

Participants attended individual testing sessions that lasted an average of four hours. Clinical rating scales, socio-demographic characteristics and neurocognitive tests were collected by experienced psychiatrists and neuropsychologists. Each participant completed the corresponding self-report instruments individually.

#### 2.2.1. Emotional intelligence assessment

The Mayer–Salovey–Caruso Emotional Intelligence Test 2.0 (MSCEIT; Mayer et al., 2003, Spanish adaptation by Extremera and Fernández-Berrocal, 2009) is a self-report instrument composed of 141 items and eight ability subscales designed to evaluate the four branches of emotion processing: (1) Identifying emotions – the ability to recognize emotions, (2) Facilitating emotions – the ability to generate and then reason with emotions, (3) Understanding emotions – the ability to comprehend emotional information, and (4) Managing emotions – the ability to regulate emotions.

The MSCEIT is administered in the form of a booklet containing all the necessary instructions, the test items and a response sheet. Responses include 5-item Likert ratings with specific anchor points for some items and 5-item multiple-choice format for others. Total score, four scores corresponding to the four-branch model and eight task scores were calculated according to a general consensus method standardized by age and sex. Average score was 100 and standard deviation was 15, derived from the Spanish normative sample scores (Extremera and Fernández-Berrocal, 2009).

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