



## Social cognition and neurocognitive deficits in first-episode schizophrenia



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### ABSTRACT

**Background:** Recent research has shown a significant impact of social cognitive domains on real world functioning and prognosis in schizophrenia. However, the correlations between specific aspects of social cognition, neurocognition, IQ and clinical symptoms remain unclear in first-episode schizophrenia. Researchers have speculated about social cognitive subgroups since patients with schizophrenia appear to be a very heterogeneous group.

**Methods:** Patients with a recent diagnosis of first-episode schizophrenia were tested regarding theory of mind, social perception, neurocognition, IQ, and clinical symptoms.

**Results:** Data from 36 first-episode schizophrenia patients and 36 one to one matched healthy controls were analysed. Principal component analysis in the patient group was used to examine the variance contributed by different aspects of social cognition, neurocognition, and clinical symptoms.

**Conclusions:** Complex aspects of social cognition explained 24% of the variance in the patient group. The other principal components consisted mainly of aspects of simple perception of theory of mind. Neurocognition and clinical symptoms only explained a minor proportion of the variance in the patient group. The results imply that social cognitive deficits in first-episode schizophrenia come in two distinct versions where one is a complex, cognitive demanding form linked with IQ. The other version is related to simpler forms of social cognition and independent of IQ. These two forms are comparable to the implicit and explicit mentalising discussed in the developmental literature. The two forms of social cognitive deficits are likely to require quite different social cognitive interventions.

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### 1. Introduction

There is growing evidence that aspects of social cognition, primarily theory of mind and social perception, might be better predictors of real-world functional outcome in schizophrenia than is neurocognition (Fett et al., 2011; Mancuso et al., 2011).

In 2008, the CNTRICS-initiative (Cognitive Neuroscience Treatment Research to Improve Cognition in Schizophrenia, National Institute of Mental Health, USA) specified the following areas of social cognition to be particularly affected in schizophrenia: Theory of mind, social perception, social knowledge, attributional biases, and emotion processing

(Green et al., 2008). These social cognitive domains are incompatible with Bleulers original concept of autism in schizophrenia, where he defined autism as the patients' urge to live their lives in an inner fantasy world which separate them mentally from the real the world (Bleuler, 1983; Parnas et al., 2002).

Research has shown that social cognitive deficits are stable across different phases of illness, are seen among first degree relatives and thus are considered to be trait related (Green et al., 2012; Horan et al., 2012; Bora and Pantelis, 2013). Furthermore, a variety of social cognitive deficits and biases are thought to underlie various psychotic symptoms, such as paranoia (Frith and Corcoran, 1996; Moritz and Woodward, 2007; Penn et al., 2008).

A recent meta-analysis investigated the effect-sizes of the above-mentioned five social cognitive domains and concluded that theory of mind and social perception were the domains most severely affected in schizophrenia patients compared to healthy controls (Savla et al., 2012).

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Research has shown no clear relationship between social cognition, neurocognition, IQ, clinical symptoms and functional outcome (Fiszdon and Johannesen, 2010; Koelkebeck et al., 2010; Fett et al., 2011; Mancuso et al., 2011; Schmidt et al., 2011; Pinkham and Harvey, 2012; Hedman et al., 2013; Lin et al., 2013). However there is agreement that further investigation of these possible correlations are important for improving future treatment of schizophrenia.

In current clinical practice social cognitive deficits in first-episode schizophrenia are not routinely assessed in a systematic way, and therefore these deficits are not taken into account when planning treatment strategies for patients. However research has shown promising results for social cognitive training programs. This underlines the necessity to identify patients in need of such treatment (Kurtz and Richardson, 2012).

The aim of this study was to measure theory of mind and social perception in a Danish population of first-episode schizophrenia patients and a matched healthy control group. We also wanted to validate the Danish translations of the tests in terms of comparability to the English versions. We used two versions of The Hinting Task (Corcoran et al., 1995; Marjoram et al., 2005) and The Awareness of Social Inference Test – part A2 Social inference (minimal) (McDonald et al., 2003; McDonald et al., 2006). Further, The Animated Triangles Task, a non-verbal social cognitive test of implicit theory of mind was used (Abell et al., 2000; Castelli et al., 2000).

It was hypothesized that patients would perform worse than the healthy controls across all social cognitive tests and show deficits similar to those observed in the English versions of the social cognitive tests.

A further aim was to describe the relationship between clinical symptoms, aspects of social cognition and neurocognition. We also wanted to measure the impact of premorbid and current IQ on social cognition and neurocognition.

Revealing such relationships could have great impact on clinical interventions such as psychotherapy, psychoeducation, neurocognitive remediation, and social cognitive training.

## 2. Methods

### 2.1. Subjects

Patients were recruited from the OPUS Clinic for young people with schizophrenia, which involves an intensive 2-year early-intervention program consisting of assertive community treatment, cognitive behavioural therapy, psychoeducational family treatment, and social skills training (Bertelsen et al., 2008). All patients were diagnosed with first-episode schizophrenia (FES) according to ICD-10 and were included in the project from January 1st 2009 till February 1st 2010.

Healthy control subjects were recruited via advertisements in four local newspapers.

### 2.2. FES subjects

Patients included met the ICD-10 (International Classification of Disease 10th edition, WHO) criteria for schizophrenia and had received less than 3 months of antipsychotic medication prior to the diagnostic interview at the OPUS clinic. Both genders were included, between the age of 18 and 30 years. During the inclusion period 60 patients received a FES diagnosis at the OPUS clinic. Forty-six patients met the inclusion criteria for this study. Ten of these patients either did not wish to participate, or had no contact to their primary OPUS therapist. These ten patients did not differ from the 36 participating FES patients regarding age, sex, or subtype of schizophrenia.

Patients were excluded if they had a history of neurological disorder or severe head trauma according to ICD-10 or an ICD-10 diagnosis of drug- or alcohol dependency. Further exclusion criteria were an estimated premorbid IQ < 70 based on previous history and not being able to understand spoken Danish sufficiently to comprehend testing

procedures. Fourteen FES patients were excluded: three patients had neurological disorders; 7 patients were drug dependent; 3 patients did not speak Danish; and 1 patient was blind.

### 2.3. Healthy control subjects

FES patients and healthy control subjects were matched one-to-one using the following criteria: age, gender, race/ethnicity, handedness, educational level (based on the last commenced education), community of residence and parental social economic status (based on the highest parental education and expected parental income according to Statistics Denmark regarding wages) ([www.dst.dk/en](http://www.dst.dk/en)). Parental socio-economic group was divided into high (N = 14; 38.9%), middle (N = 19; 52.8%), and low (N = 3; 8.33%).

Thirty-six healthy control subjects were included. Healthy control subjects were excluded if they had a history of mental illness (self or among first-degree relatives); had a history of severe head injury or neurological illness (meeting ICD 10 criteria); an ICD-10 diagnosis of drug- or alcohol dependency; had an estimated IQ below 70; or were unable to understand spoken Danish good enough to understand testing procedures. We were contacted by more than 300 healthy subjects based on our newspaper advertisements. Subjects were asked to fill out a small questionnaire regarding age, gender, education, parental education. VB then contacted subjects who matched a patient and made sure that all inclusion criteria and none of the exclusion criteria were met before testing the healthy subjects.

### 2.4. Ethics

All participants in this study received written and verbal information about the project and written consent was obtained before inclusion.

The study was approved by The Central Denmark Region Committees on Biomedical Research Ethics (Ref: M-2009-0035) and the Danish Data Protection Agency. The project complied with the Helsinki-II declaration.

### 2.5. Measures

#### 2.5.1. Social cognition measures

**2.5.1.1. Social perception. TASIT** (The Awareness of Social Inference Test – Part A2 Social Inference (minimal)) is a test composed of 15 small video clips where professional actors perform small everyday interactions (McDonald et al., 2003; McDonald et al., 2006). Each film clip lasts for 16–53 s. After each clip, the viewer has to figure out whether the people in the clip were being sincere or sarcastic by analysing paralinguistic cues (e.g. tone of voice), facial expressions and verbal content. The test consists of three different types of video clips: In the *sincere* clips there is congruence between what the persons are literally saying and the paralinguistic and facial cues. In the *simple sarcastic* clips one of the persons is being sarcastic, and there is incongruence between the spoken word and paralinguistic and facial cues. Simple sarcasm can only be identified by interpreting these cues correctly and recognizing the contradictions. In the *paradoxical sarcastic* clips the dialogue between two people only makes sense if one is able to detect the sarcasm being used in the clip, i.e. a literal interpretation of the interaction is meaningless (please, see an example of paradoxical sarcasm in Appendix A). Each film clip is followed by four questions concerned with different aspects of the communicative intentions of the persons (what they were doing, saying, thinking, and feeling). The maximum total TASIT score is 60 (range 0–20 from each of the three film versions). The total TASIT score of 60 can also be obtained by adding the subscores of the ‘do’, ‘say’, ‘think’, and ‘feel’ questions (range 0–15).

**2.5.1.2. Theory of mind (ToM) tasks.** The *Hinting Task* is a widely used test of theory of mind in schizophrenia. We used the original 10 stories

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