



Theory of mind in schizophrenia: Error types and associations with symptoms



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ABSTRACT

Introduction: Social cognition is an important determinant of functioning in schizophrenia. However, how social cognition relates to the clinical symptoms of schizophrenia is still unclear. The aim of this study was to explore the relationship between a social cognition domain, Theory of Mind (ToM), and the clinical symptoms of schizophrenia. Specifically, we investigated the associations between three ToM error types; 1) “overmentalizing” 2) “reduced ToM and 3) “no ToM”, and positive, negative and disorganized symptoms.

Methods: Fifty-two participants with a diagnosis of schizophrenia or schizoaffective disorder were assessed with the Movie for the Assessment of Social Cognition (MASC), a video-based ToM measure. An empirically validated five-factor model of the Positive and Negative Syndrome Scale (PANSS) was used to assess clinical symptoms.

Results: There was a significant, small-moderate association between overmentalizing and positive symptoms ($\rho = .28, p = .04$). Disorganized symptoms correlated at a trend level with “reduced ToM” ($\rho = .27, p = .05$). There were no other significant correlations between ToM impairments and symptom levels. Positive/disorganized symptoms did not contribute significantly in explaining total ToM performance, whereas IQ did ($B = .37, p = .01$). Within the undermentalizing domain, participants performed more “reduced ToM” errors than “no ToM” errors.

Conclusion: Overmentalizing was associated with positive symptoms. The undermentalizing error types were unrelated to symptoms, but “reduced ToM” was somewhat associated to disorganization. The higher number of “reduced ToM” responses suggests that schizophrenia is characterized by accuracy problems rather than a fundamental lack of mental state concept. The findings call for the use of more sensitive measures when investigating ToM in schizophrenia to avoid the “right/wrong ToM”-dichotomy.

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1. Introduction

Social cognition is a rapidly growing area of schizophrenia research. One of the most commonly studied domains, Theory of Mind (ToM), refers to the ability to infer the intentions, dispositions and beliefs of others (Green and Horan, 2010). A large body of research confirms that ToM is disrupted in patients with schizophrenia, with average ToM performance more than one standard deviation below healthy controls (Sprong et al., 2007). Studies have found that these impairments are specific, and not due to deficits in executive functioning or general neurocognitive impairment (e.g. Allen et al., 2007; van Hooren et al., 2008; Brüne, 2005); however, recent evidence indicate associations between IQ and complex social cognition abilities (Bliksted et al., 2014). Females have been found to outperform males in some social cognition domains (e.g. Vaskinn et al., 2007; Scholten et al., 2008).

Fuelling the interest in social cognition is its role as a determinant of functional outcome in schizophrenia. Schmidt et al.'s review (2011) found social cognition to mediate a significant indirect relationship between neurocognition and functional outcome, and ToM specifically seems to serve as an important mediator between neurocognition and social competence (Couture et al., 2011). Social cognition has been found to be more strongly associated with community functioning than neurocognition, with the strongest associations found with ToM (Fett et al., 2011). This makes social cognition an important target for interventions that can improve daily functioning for patients (Pinkham, 2014).

Psychotic symptoms are routinely assessed in the treatment of schizophrenia. But despite all that is known about symptoms, we lack a needed understanding of the relationship between major symptom dimensions and ToM (Ventura et al., 2013). Some studies have found ToM impairments to be relatively stable across different phases of the illness (Horan et al., 2012; Bora et al., 2009), whereas others report significant changes across phases (Balogh et al., 2014; Drury et al.,

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1998). Sprong et al.'s meta-analysis (2007) revealed that participants with symptoms of disorganization had significantly lower ToM scores than those in other symptomatic subgroups. A meta-analysis of 154 studies (Ventura et al., 2013) suggested moderate associations between ToM ability and disorganization and negative symptoms, respectively, whereas the associations between ToM and positive symptoms were weaker. A more detailed knowledge of the associations between symptoms and social cognitive processes could help broaden our understanding of schizophrenia and guide the development of social cognitive training programs.

One way to bring the field forward is through the use of more sophisticated methods to assess ToM (Abu-Akel and Shamay-Tsoory, 2013). Tasks tend to only be scored in correct/incorrect ToM, which may camouflage the different kinds of ToM errors that explain reduced performance. One distinction, introduced by Frith (1992, 2004), between “overmentalizing”—to excessively attribute intentions or self-referential meaning to others, and “undermentalizing”—to lack a functional concept of mental states, is of potential importance. This distinction seems to be useful, as emerging evidence suggest that undermentalizing is associated with negative symptoms and overmentalizing with positive symptoms (Montag et al., 2011).

Furthermore, a distinction can be made within the domain of undermentalizing; between lacking capacity for ToM (“no ToM”) and accuracy problems (“reduced ToM”). Results have been mixed as to whether persons with schizophrenia have a fundamental ToM deficit, similar to the one found in persons with autism (Klin, 2000; Couture et al., 2010), or if they possess the capacity for correct ToM but fail to apply it accurately (e.g. Bowler, 1992; Pickup and Frith, 2001). According to Roberts and Pinkham (2013), conflicting results on this distinction highlight the need for more research that can determine whether persons with schizophrenia have “true” ToM deficits. So far, only very few studies have investigated the different ToM error types in schizophrenia, due to lack of instruments allowing a more detailed analysis.

The current study aims to explore in detail the relationship between symptom groups and ToM error types. This is the first time, to our knowledge, that the associations between symptoms and different ToM errors are assessed using an empirically validated five-factor model of the PANSS (Wallwork et al., 2012), in line with the most recent literature in the field (Langeveld et al., 2013). A video-based ToM test is applied, due to strong support of the ecological validity of such measures over static pictures or verbal vignettes (Mehl et al., 2010; Bazin et al., 2007). The instrument discriminates between three different kinds of ToM errors: overmentalizing, reduced ToM (accuracy problems) and no ToM (lack of mental concept). The latter two are both considered to be aspects of undermentalizing. In line with Frith's theoretic framework (2004), we ask whether this error sensitive ToM measure is able to detect associations between (1) overmentalizing and positive symptoms, (2) the undermentalizing domains and negative symptoms, and (3) the undermentalizing domains and disorganization symptoms. As ToM is a complex social cognitive ability, associations with IQ will be explored. Finally, to investigate what Roberts and Pinkham (2013) call the distinction between “deficit” and “accuracy problems” in ToM, we want to examine whether our participants will perform more “reduced ToM” errors than “no ToM” errors.

2. Methods

2.1. Participants

Fifty-two participants (33 males, 19 females) with a DSM-IV diagnosis (APA, 1994) of schizophrenia or schizoaffective disorder (schizophrenia: $n = 38$, schizoaffective: $n = 14$) were included. All were participants in the TOP at the Norwegian Centre for Mental Disorders Research (NORMENT) study. They were recruited from Oslo and Akershus University Hospitals.

Inclusion criteria were Norwegian as mother tongue or all compulsory schooling conducted in Norway. Exclusion criteria were IQ < 70, and either present or past neurological disease, such as epilepsy, or previous head trauma causing hospitalization. None of the participants were tested in an acute phase. Three participants did not use psychotropic medication, the rest were on various antipsychotic medication. Informed consent was signed by all participants. The study was approved by the Regional Committee for Medical Research Ethics and the Norwegian Data Inspectorate.

Diagnosis was based on the Structured Clinical Interview for DSM-IV (SCID-I, First et al., 1995). The mean age was 28.8 years, and mean estimated IQ level as measured by the “Vocabulary” and the “Matrix Reasoning” subtests from Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 2007) was 99.7 (IQ 73–123, ± 13.4). IQ scores were normally distributed. See Table 1 for demographic information.

ToM was measured with the Norwegian version of Movie for the Assessment of Social Cognition (MASC), introduced by Dziobek et al. (2006). MASC is a 15-minute video film where two men and two women have a dinner party. Participants answer a total of 45 multiple-choice questions, and they are instructed to make inferences about what the video characters think, feel or intend in the moment the movie is paused. The movie scenes depict social situations like misunderstandings, irony, ambiguous body language, flirting and insults between the four characters. The test discriminates well between healthy controls and patients with schizophrenia (Montag et al., 2012), bipolar disorder (Montag et al., 2010), borderline personality disorder (Preissler et al., 2010; Sharp et al., 2011) and unipolar depression (Wolkenstein et al., 2011). The interrater reliability and internal consistency are considered to be good (Fleck, 2007). MASC yields a summed score for all questions, indicating general ToM performance. Additionally, errors are categorized into three types: 1) overmentalizing, 2) “reduced ToM” and 3) “no ToM”. An “overmentalizing” answer reflects an overly complex interpretation of the social clues given in the video. A “reduced ToM” response reflects an overly simplistic answer, despite intact capacity to represent mental states, whereas a “no ToM” response indicates the complete lack of a mental state concept.

Symptom severity was assessed with The Positive and Negative Syndrome Scale (PANSS) for Schizophrenia (Kay et al., 1987). The 30 PANSS items can be grouped into three main scales. Numerous factor analyses (Emsley et al., 2003) have suggested that a five-factor model better captures the PANSS structure than the original three (Wallwork et al., 2012; van der Gaag et al., 2006). A recent study examining the statistical fit of five different PANSS factor models in a psychosis sample (Langeveld et al., 2013) found Wallwork et al.'s (2012) model to have the most optimal fit. As several well-validated factor analyses now recommend using a five-factor model of PANSS, the present study

Table 1
Demographic data.

Sex	33 males (63%) 19 females (37%)
Age	Mean: 28.8 (range 18–51)
Years of education	Mean: 11.5 years (range: 4–17, ± 2.5)
Medication	Mean: 1.2 times recommended daily dose of antipsychotics (range: 0.0–6.7, ± 1.1)
IQ (WASI)	Mean: 99.7 (range: 73–123, ± 13.4)
Illness duration (y)	Mean: 5.7 years (range: 0–29, ± 5.9)
GAF function	Mean: 43.4 (range 25–68, ± 10.0)
Living situation	38 outpatients, 12 inpatients, 2 missing
Positive symptoms factor	10.5 (± 3.9)
Negative symptoms factor	11.9 (± 5.8)
Disorganized symptoms factor	5.8 (± 2.8)

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