



Theory of Mind in first-episode schizophrenia patients: Correlations with cognition and personality traits

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ABSTRACT

Introduction: There is substantial evidence for Theory of Mind (ToM) deficits in patients with schizophrenia. Many psychotic symptoms may best be understood in light of an impaired capacity to infer one's own and other persons' mental states and to relate those to executing behavior. The aim of our study was to investigate ToM abilities in first-episode schizophrenia patients and to analyze them in relation to neuropsychological and psychopathological functioning.

Materials and methods: A modified Moving Shapes paradigm was used to assess ToM abilities in 23 first-episode patients with schizophrenia and 23 matched healthy controls. Participants had to describe animated triangles which moved (1) randomly, (2) goal-directed, or (3) in complex, socially interactive ways (ToM video sequences). Neuropsychological functioning, psychopathology, autistic and alexithymic features as well as empathetic abilities were correlated with ToM performance.

Results: Compared to healthy controls, first-episode schizophrenia patients gave more incorrect descriptions and used less ToM-related vocabulary when responding to socially complex ToM video sequences. No group differences were revealed for videos with random movements. ToM abilities correlated significantly with positive symptoms, reasoning, verbal memory performance and verbal IQ, but not with empathetic abilities or autistic and alexithymic features. When controlling for reasoning, verbal memory performance and verbal IQ, the correctness of video descriptions was still significantly worse in schizophrenia patients.

Discussion: The results of our study in first-episode schizophrenia patients underline recent findings on ToM deficits in the early course of schizophrenia. Only a moderate influence of neurocognitive deficits on ToM performance was observed. Impairment in ToM abilities seems to be predominantly independent of clinical state, alexithymia and empathy.

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1. Introduction

The term "Theory of Mind (ToM)" refers to the capacity to infer both one's own and other peoples' mental states. A

substantial body of research has highlighted impaired ToM in a variety of neuropsychiatric disorders. ToM abilities have been extensively observed in autistic syndromes, and researchers have found a reduced or even total lack of ability in perspective taking (Shamay-Tsoory, 2008), empathy (Baron-Cohen and Wheelwright, 2004) and ToM capacities (Castelli et al., 2002).

Recent research has focused on ToM abilities, and there is solid empirical evidence suggesting that ToM is impaired in schizophrenia patients. It has also been suggested that many psychotic symptoms, including delusions of alien control and persecution (Blakemore et al., 2003), may best be understood in

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light of a disturbed capacity of patients to relate their own intentions to executive behavior and their ability to monitor others' intentions (Frith, 1992). These "mentalizing" deficits have been observed in first- and second-order false belief tasks (Mazza et al., 2001; Pilowsky et al., 2000), the understanding of humorous material (Brunet et al., 2003), and empathetic perspective taking (Langdon et al., 2006; Montag et al., 2007).

There is an ongoing discussion on whether ToM is a subdomain of neurocognitive functions or a deficit that stands for itself. There is some evidence that ToM deficits might be a possible trait marker for schizophrenia, as they have been found in unaffected siblings (Irani et al., 2006), in schizotypal subjects (Jahshan and Sergi, 2007; Langdon and Coltheart, 2004; Pickup, 2006) and during remission periods of schizophrenia patients (Martino et al., 2007; Sprong et al., 2007). Also, Sprong et al. (2007) concluded from their meta-analysis that the impairment of patients in remission underlines the assumption of mentalizing impairment as a possible trait marker. By definition, a trait marker has to occur even in symptom-free intervals, must be present in persons at risk of developing the illness (Asarnow and MacCrimmon, 1978; Zubin and Spring, 1977), should be independent from other neurocognitive functions and must be time-stable, e.g., must also be present in phases of remission. Some authors (Fine et al., 2001; Shaw et al., 2004) regard ToM deficits in schizophrenia patients as a failure of a neural network mediating ToM in the brain, independent of other functions such as IQ, psychopathology or neuropsychological performance. Harrington and colleagues (2005) performed a narrative review in which they favored the idea of ToM deficits being a trait-like characteristic. These authors reported data on impaired ToM abilities in relatives of schizophrenia patients and in remitted schizophrenia patients that were independent of IQ and neurocognitive functioning. Bruene (2005) argues in another review of ToM functioning in schizophrenia that the deficits should be trait-dependent because ToM deficits are present at times other than during acute phases of the illness and thus fulfill the criterion of being stable over time (Sarfaty et al., 2000). Furthermore, the finding that ToM deficits have been found even in childhood schizophrenia (Pilowsky et al., 2000) supports the hypothesis that ToM deficits might trigger symptom severity and chronicity of illness. Contrary to these assumptions, other authors state that additional factors such as memory impairments (Frith and Corcoran, 1996), intellectual functioning (Bertrand et al., 2007; Bora et al., 2005; Bruene, 2003; Pentaraki et al., 2008) and language (Bruene, 2003) might have an impact on ToM deficits, and thus ToM might not be an independent deficit. On the other hand, Pickup (2008) concluded in his review on executive functioning and ToM that these two functions are independent.

Furthermore, the severity of mentalizing deficits has been found to correlate with schizophrenia symptoms, such as thought disorder or positive psychotic symptoms (Mazza et al., 2001; Russell et al., 2006). Frith (1992) states that ToM deficits are predominantly present in patients with positive symptoms and might therefore be a state-dependent characteristic of acute illness. In the first study to observe ToM deficits in schizophrenia patients with the Moving Shapes paradigm (used in the present study), all symptom sub-groups failed to use the appropriate mentalizing language to describe ToM animations, although sub-groups with positive symptoms and behavioral signs additionally failed to describe the videos

correctly. Thus, Russell et al. (2006) suggested that a failure to use appropriate mentalizing language may be a trait rather than a state marker of the illness.

In chronic schizophrenia, impairment in ToM abilities and deficits in other neurocognitive domains often co-occur (Pousa et al., 2008), and the differentiation between effects of neurocognitive deterioration and social cognition deficits becomes more difficult as the illness progresses. One way to minimize the interaction effects between ToM deficits and deficits of other neurocognitive domains is to investigate patients in a very early stage of the illness. A few recent studies have thus investigated ToM deficits in first-episode patients (Bertrand et al., 2007; Inoue et al., 2006; Kettle et al., 2008) and found that in this patient group, ToM functioning was less effective than in healthy controls.

Abell et al. (2000) developed a paradigm to investigate ToM deficits employing video sequences depicting two triangles as socially interacting geometric moving shapes. This paradigm has successfully verified deficits of performance in autistic (Castelli et al., 2002) and alexithymic patients (Moriguchi et al., 2006). The paradigm has also been shown to activate the neuronal ToM network in imaging studies (Castelli et al., 2000). Impaired performance on this task has been demonstrated in sub-groups of schizophrenia patients by Russell et al. (2006). The Moving Shapes paradigm is a dynamic intentional movement interpretation task that adds spatial and temporal awareness to the assessment of ToM, thus making it a powerful model of real world demands. The paradigm is considered to involve a high level of abstraction and is not fully comparable with other types of ToM tests (Sprong et al., 2007).

The aim of this study was to investigate ToM dysfunction in first-episode schizophrenia patients using the ToM task implemented by Abell et al. (2000) and to analyze the correlation between neurocognitive functioning and mentalizing deficits. We expected patients to be impaired in the appropriateness of their descriptions of the video sequences relating to ToM abilities. More importantly, we expected no significant correlations between ToM performance and neurocognitive functioning or psychopathology, as we hypothesized ToM dysfunctions existing independently of clinical state and neuropsychological abilities.

According to clinical experience, autistic symptoms are present in schizophrenia patients, although there is limited empirical data on the prevalence of these symptoms (Alamy et al., 2004; Kaplan and Sadock, 2007; Parnas and Bovet, 1991). Also, empathy abilities seem to be reduced in schizophrenia patients and are related to ToM performance (Bora et al., 2008). Moreover, alexithymic traits seem to be present in schizophrenia (Nkam et al., 1997), and healthy controls with higher levels of alexithymia have been shown to have fewer mentalizing abilities (Moriguchi et al., 2006). As autistic traits, alexithymia and empathetic abilities seem to be associated with schizophrenia, we controlled these factors in our analysis of ToM abilities.

2. Materials and methods

2.1. Participants

Twenty-three first-episode schizophrenia patients diagnosed using the Structured Clinical Interview for DSM-IV

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