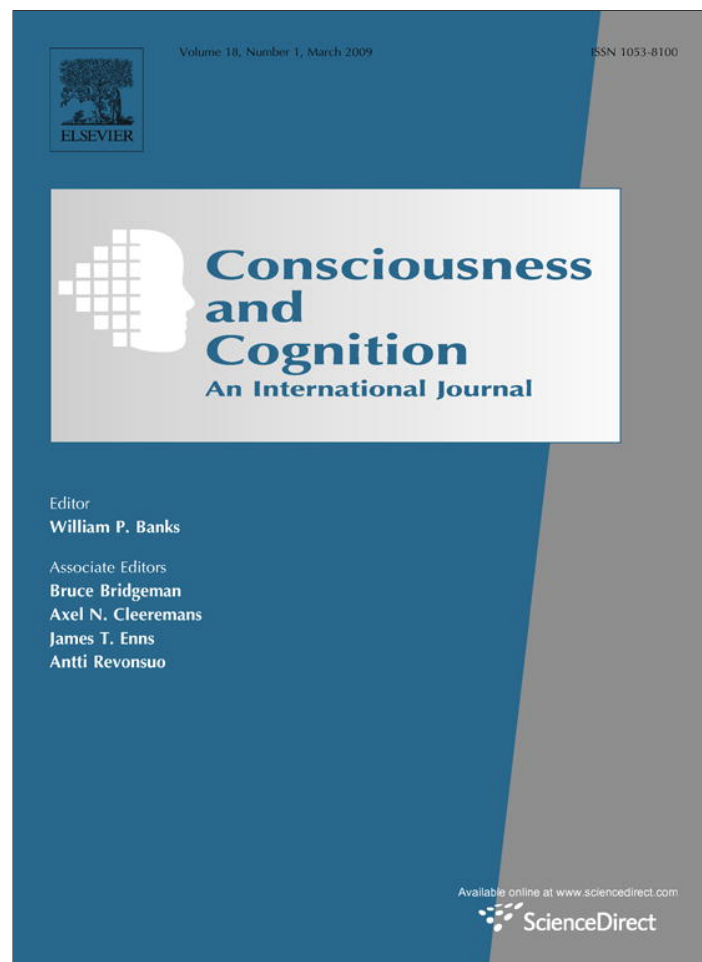


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## Commentary

# Theory of mind and schizophrenia ☆

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### ABSTRACT

A number of cognitive and behavioral variables influence the performance in tasks of theory of mind (ToM). Since two of the most important variables, memory and explicit expression, are impaired in schizophrenic patients, the ToM appears inconsistent in these patients. An ideal instrument of ToM should therefore account for deficient memory and impaired ability of these patients to explicitly express intentions. If such an instrument is developed, it should provide information that can be used not only to understand the pathophysiology but also to monitor patients.

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Even though the theory of mind (ToM) is recognized as an important cognitive ability (Premack & Woodruff, 1978) and is considered an important determinant of social skill, its scope remains largely undefined. There is therefore, no consensus on the methodological approach that would best reveal deficits. The approach proposed by Bosco and colleagues in the Th.o.m.a.s. assessment scale (Bosco et al., 2009) may have a broader scope and is distinct from that used in other scales. The Th.o.m.a.s. scale is based on the assumption that ToM is essentially a function of a number of dissociable components and each component can be separately assessed. This assumption may give the scale an edge over other scales, particularly for evaluation of psychiatric patients.

Most tests use direct methods for evaluation of ToM abilities and all of these tests are generally very efficient in detecting deficits in autistic patients who have significantly impaired social skills (Baron-Cohen, Leslie, & Frith, 1985). The ability of these tests to detect deficit in other conditions is however, less clear. In most conditions, including schizophrenia, investigators have acquired inconsistent data because performance in tests of ToM depends on the integrity of a number of cognitive and behavioral variables. Since most of these variables are compromised at varying degrees in individual patients, task performance is often inconsistent (Brune, 2005). The inconsistency in schizophrenia is revealed in meta-analyses. For example, a recent analysis (Harrington, Siegert, & McClure, 2005) indicated that most (80%) patients with behavioral symptoms are impaired in ToM tasks. About half of those with paranoid symptoms are also impaired but no impairment is reported in patients with delusions and hallucinations. The analysis indicates that the tests elicit fairly consistent results in patients who have behavioral, delusional or hallucinatory symptoms, but detect deficits in only half of the paranoid schizophrenics, sug-

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gesting that the factor (or factors) other than paranoia is important for deficient ToM. This underscores the need for identification of factors that drive results in ToM tests.

The identification however, is not easy because ToM involves both, social and personal cognitive functions. A deficit in a component of either of these functions is likely to affect ToM, because it shares a number of components with both forms of cognition. For example, the ability to recognize facial expression is an important component of both social cognition (Seyfarth, Cheney, & Bergman, 2005) and ToM. In the context of social cognition recognition of facial expression allows better communication but in ToM tasks it helps in detection of intentions and deceptions. A deficit in social cognitive ability would therefore impair performance in ToM tests, even though ToM is not needed for social cognition (Frith, 2004). Similarly, a number of personal cognitive abilities affect the ToM. Most important of these abilities is memory, which is needed to recall past experiences to judge intentions and deceptions (Bright-Paul, Jarrold, & Wright, 2008). It is therefore not surprising that prominent theories of ToM, the theory-theory (Perner, 1991) and simulation theory (Gordon, 1996), emphasize that integrity of the mnemonic system is essential for efficient performance in ToM tasks. Thus, according to theory-theory we understand mental status of others by retrieving past experiences. The simulation theorists on the other hand believe that understanding of others' intentions involve putting ourselves in their shoes and analyze their intentions based on our own past experiences. Thus, both theories suggest that memory retrieval is critical for ToM. An impaired memory would therefore lead to deficient ToM.

Since memory deficits affect performance in ToM tests, it is difficult to interpret test results in patients who have impaired memory. In this context, consistent finding of impaired episodic memory in schizophrenic patients is important (Bacon, Izaute, & Danion, 2007; Clare, McKenna, Mortimer, & Baddeley, 1993), particularly because the impairment involves long-term associative memory (Achim & Lepage, 2003). These memories are necessary for efficient performance in the ToM tasks because these tasks require retrieval of associations between situations, persons and intentions. Since none of the ToM tasks estimate effects of impaired memory, it is not known how this impairment influences performance in schizophrenic patients. It is however, not unreasonable to expect that variations in the levels of memory impairment could at least in part, be responsible for inconsistent ToM data in schizophrenia (Abu-Akel, 2008; Brune, 2005).

Another important factor that could affect performance in ToM tasks is the ability to express thoughts and intentions. Since interpretation of performance in these tasks is based on the assumption that the response reflects inner thoughts and intentions, an impaired expressive ability could cause dichotomy between performance and intention resulting in misleading conclusions. The effect of this dichotomy on ToM tests was elegantly demonstrated in a modified version of a popular ToM test involving imagery characters Sally and Anne (Wimmer & Perner, 1983). In this version 3-year old children were told that Sally would enter the room using the door that is closest to the box where she thinks a marble was hidden. Almost 80% of children look at the 'correct' location when informed that Sally is about to enter the room to pick her marble. However, when asked to point the location where she would look for the marble, only 45% made correct response (Clements & Perner, 1994). This observation is relevant in schizophrenia because expressive problem is not uncommon in this condition (Flack, Laird, & Cavallaro, 1999). Based on the degree of expressive impairment, performance of individual schizophrenic patients is expected to be different. It is therefore not surprising that worst performers (patients with behavioral symptoms) are also the worst expressers; and best performers (patients with delusions and hallucinations) have no expressive difficulties (Harrington et al., 2005).

It is therefore unclear whether ToM impairments in schizophrenia reflect impaired expression or impaired ToM. It could also be due to a combination of both and the extent to which expressive difficulties affect the results could depend on the site of lesion because damage in the fusiform gyrus could be associated with these difficulties (Premkumar et al., 2008; Seiferth et al., 2008). The area around this gyrus is known to regulate retrieval of nonconscious information (Badgaiyan, 2000; Badgaiyan & Posner, 1997; Badgaiyan, Schacter, & Alpert, 1999; Schacter & Badgaiyan, 2001), which is consciously expressed only if projected to the frontal cortex (Badgaiyan, 2005). Thus, if the regulatory neurons around fusiform are damaged, nonconscious information cannot be retrieved and cannot be projected to the frontal cortex for conscious expression. This would prevent patients to explicitly express real intentions.

The issue that is most relevant in this context is the relationship between performances of these patients in the ToM tasks and in the real life. It is not known whether in real life situations their actions are guided by the 'real' but unexpressed, or by the 'unreal' but expressed intentions. If unexpressed intentions guide their actions, ToM tests would not test their abilities correctly. Thus, until we know whether the patients use real or expressed intentions, the best strategy to evaluate ToM is to separately assess relevant determinants. This strategy would maximize our understanding of the deficit. In this regard, Th.o.m.a.s. (Bosco et al., 2009) has an edge over other tests because it allows separate scoring of egocentric and allocentric perspectives. However, Th.o.m.a.s.'s finding of no significant difference in the two perspectives in schizophrenic patients may be troubling because it is not consistent with the majority opinion. Most investigators believe that egocentric tendencies are enhanced and allocentric tendencies are suppressed in these patients, particularly if positive symptoms are not dominant (Maggini & Raballo, 2004; Weniger & Irle, 2008). This inconsistency underscores the need to reevaluate and refine assumptions of Th.o.m.a.s. Re-evaluation is needed also because impairments in most measures of the scale were correlated with impaired IQ. This correlation may indicate that nonspecific (rather than specific) deteriorations in mental abilities affect the scales more than the specific deficits. Unless there is a compelling evidence to suggest that IQ predictably influences ToM abilities (which is not unlikely), there will be doubts on the ability of this scale to reliably measure ToM. Additionally, like most of the other tests, the Th.o.m.a.s. scale is unable to account for cognitive and behavioral deficits. It is therefore important that the

test is modified to separately evaluate contribution of these deficits (particularly those related to memory and expressive functions) on ToM task performance. Despite these problems, Th.o.m.a.s. is a useful instrument for evaluation of aspects of ToM. Because of its novel approach, this instrument could be a good starting point for development of more informative and reliable scale for evaluation of ToM.

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