

# Reading the mind: a comparative study of out- and inpatients

*Lettura della mente: uno studio comparato su pazienti dimessi e pazienti ospedalizzati*

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## Summary

### Objectives

Theory of Mind (ToM) is the ability to make inferences on the mental states of others. This study investigates the state-independence and the state dependence of theory of mind (ToM) impairments in schizophrenia.

### Methods

We compared the performance of healthy controls, discharged and hospitalized patients with schizophrenia on three well-known ToM tasks, requiring mental state recognition from eyes, inferences about the mental states of others and second-order false belief attribution. Twenty-nine patients (males and females) with schizophrenia were recruited (age range, 18-50 years) in the Psychiatric Unit of the University Hospital in Catania (Italy). Patients symptomatology was assessed with the positive and negative symptoms of schizophrenia (PANSS) scale. All subjects completed the Raven progressive matrices, and from this score a relative measure of general intellectual functioning was indirectly calculated. An Italian adaptation of Baron-Cohen's Eyes Test was used. Participants were presented with 10 faux pas stories. 11 Two second-order belief tasks (birthday puppy and chocolate bar 12) were used.

### Results

All groups of patients performed significantly worse than controls on the three ToM tests.

## Introduction

Theory of Mind (ToM) is the ability to make inferences on the mental states of others. ToM deficits in schizophrenia have been investigated by a large number of studies since Frith<sup>1</sup> proposed a model supporting a relationship between mentalizing (ToM) impairment and specific symptoms of schizophrenia. Frith's concept of ToM deficit in schizophrenia suggested a state-related impairment, and proposed that the psychotic symptoms in schizophrenia might be explained by mentalizing impairment. A theoretical model by Harde-Bayle<sup>2</sup> suggested an association of ToM impairment with another symptom dimension of schizophrenia (disorganized thought), and

On the Eyes Test, control subjects performed better than the outpatients ( $t(27) = 4.4, p < .001$ ), inpatients with positive schizophrenia ( $t(31) = 6.3, p < .001$ ) and inpatients with negative schizophrenia ( $t(26) = 6.2, p < .001$ ). On the faux pas test, control subjects also performed better than outpatients ( $t(27) = 13.5, p < .001$ ), in patients with positive schizophrenia ( $t(30) = 11.4, p < .001$ ) and in patients with negative schizophrenia ( $t(26) = 13.5, p < .001$ ).

In almost all cases, the results were maintained after controlling for the mediating effect of IQ. ToM scores did not differ significantly between groups. The results revealed the presence of a specific cognitive impairment in representing and reasoning about mental states. This psychological-reasoning system is composed, to a large extent, of unconscious processes (modularity theory), and can be fractionated into two main subsystems, one dedicated, in most proposals, to reasoning about goals and perception (actional or teleological understanding) and the other to belief-desire reasoning.

### Conclusions

These results support the state independence of ToM impairment in schizophrenia. However, the results provide several recommendations for future studies. One important issue is to further test the role of ToM impairment in activity of daily life in patients with schizophrenia.

### Key words

Theory of Mind • Schizophrenia • State-independent trait • IQ

also considered the ToM deficit as a state characteristic of schizophrenia.

A meta-analysis has shown that ToM deficits in "remitted" patients were less pronounced than in non-remitted patients, and only in the remission phase is there an important role of IQ in ToM tasks<sup>3</sup>. These results suggested that there is trait-related mentalizing impairment in schizophrenia.

Other studies have supported the idea that patients with schizophrenia have a state-independent impairment in ToM. This deficit does not seem to be a consequence of the severity of symptomatology, or to be caused by other cognitive impairments<sup>4,5</sup>.

However, some studies comparing the performance of

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discharged and hospitalized patients have reported different results, with contrasting conclusions<sup>6-9</sup>.

While there is no doubt that schizophrenia patients perform poorly on ToM tasks, there are important issues that have not been adequately considered in previous studies. The main issues relate to: (i) heterogeneity of ToM tasks and their different cognitive demands (social perception, inferential reasoning, second order false belief attributions); (ii) the influence of clinical and demographic characteristics on ToM performance.

The aim of the current study was to investigate the state-independent and state-dependent components of ToM impairment in patients with schizophrenia. Tests for social perception (reading the mind in the eyes test<sup>10</sup>) and inferential reasoning (Faux-pas test<sup>11</sup>; second-order false belief tasks<sup>12</sup>) were employed.

We measured state-independent impairments by comparing healthy controls with outpatients. State-dependent impairments were measured by comparing outpatients and inpatients. The potential mediating effect of IQ on performance was also assessed<sup>13</sup>. We expected the same performance in both groups of patients, relating to the state independence of ToM impairment in schizophrenia.

## Methods

### Participants

Twenty-nine patients (males and females) with schizophrenia were recruited (age range, 18-50 years) in the Psychiatric Unit of the University Hospital in Catania (Italy). Diagnosis was confirmed by psychiatrists using the structured clinical interview for DSM-IV Axis I Disorders (SCID-I). Patients with neurological problems, mental retardation, diagnosis of Axis II DSM-IV TR or other comorbid psychiatric disorders were excluded. All patients were treated with second-generation antipsychotic drugs. Patients were divided in three groups: hospitalized patients with positive schizophrenia, hospitalized patients with negative schizophrenia and outpatients. These latter lived in their homes and were invited to the hospital for the purposes of the study<sup>14</sup>. Twenty aged-matched healthy volunteers (HC) served as controls (Table I). One

hospitalized patient with positive schizophrenia did not complete the Faux pas task and was excluded from the analysis of this task.

### Stimuli and Procedure

Patients symptomatology was assessed with the positive and negative symptoms of schizophrenia (PANSS<sup>15</sup>) scale. All subjects completed the Raven progressive matrices, and from this score a relative measure of general intellectual functioning was indirectly calculated.

*ToM – perception: eyes test.* An Italian adaptation of Baron-Cohen's Eyes Test was used<sup>16</sup>. Participants were presented 36 black and white photographs showing the ocular regions of male and female adults. On each trial, first a photograph was presented and participants were asked a control question about the gender of the person in the photo. Then, four adjectives describing complex emotions or other mental states (e.g. dispirited, bored, embarrassed, flirting) were shown below the picture and participants were asked to choose the adjective that best described the emotion represented in the photographs. Participants were asked to read all four adjectives before making their choice, and if they felt that more than one adjective was applicable, to 'choose just one that was considered to be most suitable'. The Experimenter asked: 'Which adjective best describes what this person is feeling or thinking?'. Following the procedure used by Baron-Cohen et al.<sup>10</sup>, participants were encouraged to consult a glossary of all words used in the task whenever they felt they were not sure about their meaning. To minimize the negative effects of impulsive tendencies, patients were asked to look at the stimuli for 30 s before responding. The maximum score on test and control questions was 36.

*ToM – reasoning: the faux-pas test.* Participants were presented with 10 faux pas stories<sup>11</sup>. A first question assessed whether the patient detected the faux pas: 'In the story, did someone say something that they shouldn't have said?'. If subject answered 'yes' to the first question, then he/she was asked five other test questions. Subjects who answered 'no' to the first question were not asked the remaining test questions and received score a 0 for that item (maximum score = 60).

**TABLE I.**

Clinical features of study participants. *Caratteristiche cliniche dei partecipanti allo studio.*

State	N	Symptoms (PANSS)	Age	Education	IQ	Eyes Test	Faux-pas Test	Second-order FB
Inpatient	13	Positive	30.6 (10.4)	10.1 (3.07)	74 (15.6)	17.5 (5.01)	18.2 (14.0)	1.8 (1.6)
Inpatient	8	Negative	38.5 (9.3)	8.5 (2.8)	61.3 (18.6)	18.1 (2.1)	16.8 (10.8)	2.2 (1.5)
Outpatient	9	Negative	41.1 (4.5)	9.1 (1.8)	89.7 (11.8)	20.1 (4.4)	22.8 (6.7)	1.3 (1.5)
Control	20	–	36.0 (9.2)	11.4 (2.2)	94.9 (5.3)	27.7 (4.1)	56.2 (4.3)	3.9 (0.2)

*Second-order false belief task.* Two second-order belief tasks (*birthday puppy* and *chocolate bar*<sup>12</sup>) were used. Each task included two control questions and a first-order false belief question. Participants were corrected if they failed on these questions. At the end of the task, two test questions were asked (second-order ignorance and second-order belief questions). Participants received one point for each correct answer (maximum score = 4).

## Results

The clinical features and ToM scores of participants are reported in table 1. Outpatients and hospitalized patients with negative schizophrenia differed significantly in the IQ score ( $t(15) = 3.78, p = .002$ ). Outpatients and hospitalized patients with positive schizophrenia also differed significantly in both the IQ score ( $t(20) = 2.13, p = .046$ ) and age ( $t(20) = 2.96, p = .008$ ), just as control subjects differed significantly in the IQ score vs inpatients with positive schizophrenia ( $t(31) = 4.93, p < .001$ ) and vs patients with negative schizophrenia ( $t(26) = 7.44, p < .001$ ). Controls subjects differed significantly in level of education vs outpatients ( $t(27) = 2.74, p = .01$ ) and patients with negative schizophrenia ( $t(26) = 2.93, p = .007$ ).

The scores of the three groups of patients were significantly lower than those of control subjects for all ToM tests. The performance of the three groups of patients did not differ significantly on any of the ToM tests. There was no significant correlation between the IQ score and ToM for any of the patient groups. On the *Eyes Test*, control subjects performed better than the outpatients ( $t(27) = 4.4, p < .001$ ), inpatients with positive schizophrenia ( $t(31) = 6.3, p < .001$ ) and inpatients with negative schizophrenia ( $t(26) = 6.2, p < .001$ ). On the *faux-pas test*, control subjects also performed better than outpatients ( $t(27) = 13.5, p < .001$ ), inpatients with positive schizophrenia ( $t(30) = 11.4, p < .001$ ) and inpatients with negative schizophrenia ( $t(26) = 13.5, p < .001$ ). In the second-order false belief, control subjects had a higher score than outpatients ( $t(27) = 5.2, p < .005$ ), inpatients with positive schizophrenia ( $t(31) = 4.5, p < .005$ ) and inpatients with negative schizophrenia ( $t(26) = 3.2, p < .05$ ).

ANCOVAs were computed to assess the effect of group while controlling for differences in age, level of education and IQ. In these analyses, the scores on each ToM test were analysed as outcome variables, and age, level of education and IQ as covariates, and group variable was analysed as a between subject. These analyses showed a significant effect of group, after controlling for the effect of age, IQ and level of education (respectively in the eyes test:  $F(3, 43) = 7.7, p < .001$ ; faux-pas test:  $F(3, 42) = 37.6, p < .001$ ; and second-order false belief

task:  $F(3, 43) = 9.4, p < .001$ ). In all these analyses, there was no significant effect of covariates (age, IQ and level of education, all  $p > .05$ ).

## Discussion

This study investigated a possible explanation for some difficulties in social interaction and communication in patients with schizophrenia. The results revealed the presence of a specific cognitive impairment in representing and reasoning about mental states. This psychological-reasoning system is composed, to a large extent, of unconscious processes (modularity theory), and can be fractionated into two main subsystems, one dedicated, in most proposals, to reasoning about goals and perception (actional or teleological understanding) and the other to belief-desire reasoning<sup>17</sup>.

In this study, outpatients and inpatients with negative or positive schizophrenia performed worse than controls on three different ToM tasks. ToM impairments were not associated with good prognosis during the chronic phase of illness, and it presented the same features in the presence of positive or negative symptoms. These results support the theoretical model that ToM impairment in schizophrenia is state-independent<sup>4,5</sup>.

According to a recent proposal, ToM can be analyzed into two main components: a perceptual component that deals mainly with decoding social information from facial expressions and other social signals, and an inferential component, that is responsible for mental state attribution in social scenarios<sup>18</sup>. In all three groups of patients, cognitive impairments in social perception (eyes test) and inferential reasoning (Sullivan's stories and faux pas task) were found. These results suggest the presence of impairment of ToM in patients with schizophrenia that involves their social skills and negatively influences their quality of life.

Interestingly, the lower ToM performance of the three groups of patients could not be explained by differences in IQ in almost any case. We have no strong interpretation to explain why the effect of group was no longer significant after controlling for age, IQ and level of education when comparing controls with inpatients with negative schizophrenia in the eyes test. Tentatively, symptomatology of patients may change the relationships between IQ and ToM performance. In addition, we did not find a correlation between ToM performance and demographical or clinical characteristics in all patient groups. Taken together, these results provide evidence that ToM is not linked to specific clinical features or general intelligence. Shamay-Tsoory et al.<sup>19</sup>, using a task with verbal and visual eyes cues, assessed the 'affective' and 'cognitive' ToM components (first and second order) in patients with schizophrenia, in patients with lesions localized in the ventro-

medial or dorsolateral prefrontal cortex, in patients with non-frontal lesions and healthy control subjects. Patients with schizophrenia and those with lesions in the ventromedial prefrontal cortex were impaired in affective but not in cognitive components. They concluded that the pattern of ToM deficits in schizophrenia resembled those seen in patients with lesions in the ventromedial prefrontal cortex, supporting the notion of a disturbance of the frontal- limbic circuits in patients with schizophrenia. Our data extend that study by revealing in patients cognitive ToM impairment in patients with schizophrenia, suggesting disturbances in other neural circuits, such as the temporo-parietal junction for false beliefs attribution<sup>20</sup> or the medial prefrontal cortex for inferential reasoning<sup>21</sup>.

The small number of patients could represent a limitation to this study. However, the results provide several recommendations for future studies. One important issue is to further test the role of ToM impairment in activity of daily life in patients with schizophrenia.

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