

COMPARATIVE ANALYSIS OF THEORY OF MIND TESTS IN FIRST EPISODE PSYCHOSIS PATIENTS

Alexandra Morozova^{1,3}, Zhanna Garakh², Marie Bendova³ & Yuliya Zaytseva^{1,3,4}

¹Third Faculty of Medicine, Charles University in Prague, Czech Republic

²Department of Human Higher Nervous Activity, Institute for Higher Nervous Activity and Neurophysiology,
Russian Academy of Science, Moscow, Russian Federation

³Department of Neurosciences and Brain Imaging, National Institute of Mental Health, Klecany, Czech Republic

⁴Human Science Centre, Institute of Medical Psychology, Ludwig Maximilian University, Munich, Germany

SUMMARY

The research is based on comparative analysis of 'Hinting Task', 'Faux Pas', and 'Reading the Mind in the Eyes' tests sensitivity in detection of Theory of Mind deficits. The study included 20 subjects with schizophrenia and schizophrenia spectrum disorders with the first episode of psychosis. Every subject performed the three proposed tests. It was shown that success rate of the three tests differed significantly. The non-verbal test 'Reading the Mind in the Eyes' caused the most difficulties. The success rate percentage of this test performance correlated negatively with the severity of psychopathological symptoms evaluated according to the PANSS scale. Thus, 'Reading the Mind in the Eyes' test is the most sensitive out of the three to Theory of Mind deficits detection, which may be used for diagnostic purposes.

Key words: schizophrenia - first episode - Theory of Mind - social cognition

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INTRODUCTION

Theory of Mind (ToM) is the ability to sense and acknowledge the difference between one's own and foreign psychological state that leads to certain behavioural patterns and serves as the cornerstone of one's personality.

ToM deficit has been described as a characteristic feature of many psychiatric disorders, including schizophrenia (Brune 2005, Corcoran 2003, Harrington et al. 2005). Christopher Frith states that a psychotic episode in schizophrenia may be explained by false cognitive interpretation of one's own and foreign intentions, meaning the loss of objective perception of the situation (Frith 1992). It is believed that all the patients with schizophrenia and schizoaffective spectrum disorders to a various degree suffer from impairment of social intelligence, which complicates proper perception of almost all aspects of the social environment and leads to the inability to adapt (Gurovich et al. 2016, Rychkova et al. 2010, Sofronov et al. 2012).

Precise ToM deficit estimation is crucial when working with this group of patients. Its important to track individual impediments in order to improve the diagnostics and therapy. A range of tests is commonly used to reveal ToM deficits in schizophrenia and schizoaffective spectrum disorders patients: the verbal ones include comprehension of symbolic and verbal speech, while the non-verbal ones test the understanding of gestures and facial expressions. One of the verbal tests is called 'Faux Pas' (Gregory et al. 2002, Stone et al. 1998), which literally means 'a false step' when translated from French. There are 20 suggested situations, only half of which contain an accidental tactless act or

remark. The subjects are asked to recognize the faux pas. Another shorter testing method – 'Hinting Task' focuses on the ability to understand true thoughts and feelings behind the words and actions of a person (Corcoran et al. 1995). 'Faux Pas' is a multilevel test that reveals the comprehension of social situations and behavioral motives of other people, including the ability to imagine oneself in the place of another human being. The test presents complex scenes with at least several people involved. 'Hinting Task', on the other hand, comprises more simple situations, and the subject is asked to detect the intentions of a person described in them. This task is mainly focused on being able to understand the true meaning of what has been said, i.e. 'reading between the lines', which is an integral part of one's social intelligence. The non-verbal tests include 'Reading the Mind in the Eyes', where the subjects are requested to recognize the feelings and intentions of a person according to the photo of their eyes (Baron-Cohen et al. 2001). It tests the non-verbal ToM component by detecting the ability to see the emotional state of another person through their facial expression.

The aim of this study was to compare and contrast the verbal cognitive tests of variable difficulty and the non-verbal cognitive test so as to define their sensitivity to ToM deficit detection in the first psychotic episode patients with schizophrenia and schizoaffective spectrum disorders.

METHODS

The study included 20 patients undergoing treatment in the Department of Outpatient Psychiatry and Organization of Psychiatric Care, Moscow Research Institute

of Psychiatry. Most patients were diagnosed with schizotypal disorder (65%), 25% of patients suffered from schizoaffective disorder, 10% had paranoid schizophrenia and subacute psychotic disorder. All the patients were treated with atypical antipsychotics, rarely with relevant dosage corrections.

The average age of the patients was 26.1±7 years. 13 out of 20 subjects were male (65%), 7 were female (35%). 35% of patients had higher education, 30% had incomplete higher education, 35% had secondary and secondary specialized education.

The severity of psychopathological symptoms was assessed with PANSS scale (Kay et al. 1987). The average sum was 76.8±15.0 (15.9±8.0 according to the positive symptoms scale, 18.9±6.0 according to the negative symptoms scale, 41.9±8.0 according to the general psychopathology scale).

Once given detailed instructions, the patients completed the tests. While administering Faux Pas task, the specialist read a small social situation out loud, such as friends having a conversation at a party, or neighbors running into each other in the street, and asked whether someone said anything inappropriate in the situation. In case the patient said yes, more detailed questions were asked as to who exactly was inappropriate and why. In case the patient said no, the specialist skipped to control questions, which were asked regardless of the patient's initial answer as they were aimed at revealing if the subject had a general understanding of the situation. Thus, the specialist was able to exclude random correct answers to make the test maximally objective. The task consisted of 20 situations: 10 with irrelevant verbal or non-verbal behavior, and 10 control situations. The maximal amount of points for the 10 Faux Pas-containing situations was 60 (6 per each), whereas correctly answered control questions were evaluated as 20 points altogether (2 per each). Each situation is read once only, and there was no time limit for the subject to answer.

The other verbal test called 'Hinting Task' required the patient to read the situations presented on the paper and to state what exactly the main character meant in each of them. In case of correct response, the patient was

asked to flip the card and read the additional hinting sentence to help them find the right answer. Each correct response was evaluated as 2 points; in case the subject identified the correct answer from the second attempt, 1 point was issued. Total maximum result was 20 points.

The non-verbal task 'Reading the Mind in the Eyes' consisted of 36 photos of human eyes expressing an emotion presented one after another for an unlimited time, and the subject was asked to pick the adjective describing it the best out of the 4 options available or suggest their own in case none of the options were suitable in their opinion. There was a dictionary available to ensure the greater accuracy of results.

The statistical analysis was carried out using non-parametric criteria.

RESULTS

Preliminary quantitative analysis showed that the least difficulties occurred in performance of the 'Hinting Task'. 7 out of 20 subjects achieved the maximum result, while the rest scored close to maximum. The average for the group was 91.6%. Most of the mistakes were made without a traceable pattern. As for 'Faux Pas' and 'Reading the Mind in the Eyes', nobody achieved the maximum score. Only 3 patients scored over 90% in 'Faux Pas' (the same who got maximum points on the 'Hinting Task'). The total average for this task was 73.4%. If the patient had difficulties fulfilling the test, it manifested equally in at least 50% of the stories (10 out of 20).

'Reading the Mind in the Eyes' test revealed a substantially greater ToM deficit (total average for this task was 59.6%). The patients were struggling with this task, and only 1 patient scored over 80%. Many incorrect answers of each patient had a traceable emotional or psychopathologic pattern, which allowed exploring some of their paranoid tendencies. For instance, some patients kept choosing the answer 'suspicious' as correct, or selected the adjectives with predominantly negative sense feeling.

Correlation of the test results for each subject is presented in Figure 1.

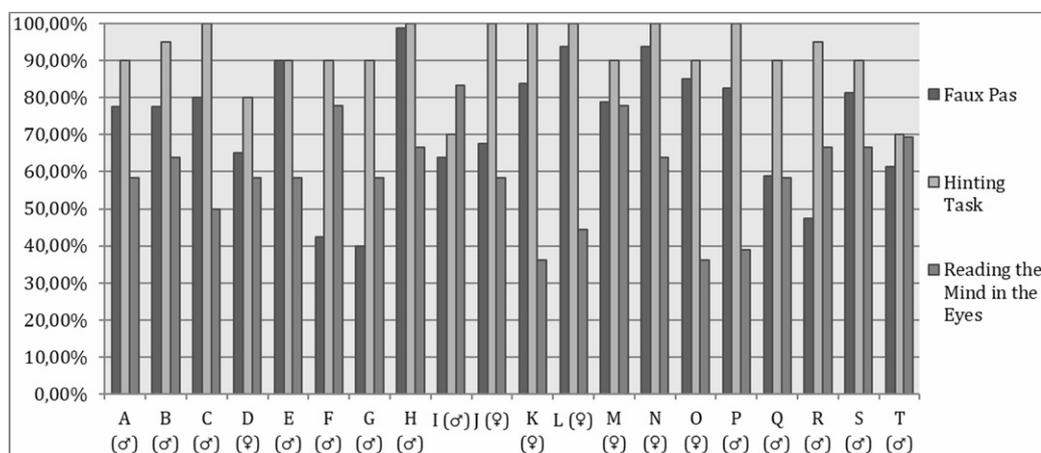


Figure 1. Comparative analysis of ToM tests (Description: x-axis represents encoded patients including their gender; y-axis represents their performance in each of the three ToM tests)

For statistical analysis, the percentage results achieved by the subjects were coded as follows: $\geq 80\%$ - 5 points, 60-79% - 4 points, 46-59% - 3 points, $\leq 45\%$ - 2 points.

The scores of the three tests used varied significantly: ANOVA ChiSqr. (N=19, df=2) =20.37, $p=0.00004$. A pairwise comparison of ToM tests scores was performed using Wilcoxon test. 'Faux Pas' vs 'Hinting Task': $p=0.012$; 'Faux Pas' vs 'Reading the Mind in the Eyes': $p=0.023$; 'Hinting Task' vs 'Reading the Mind in the Eyes': $p=0.0004$. Correlation analysis (according to Spearman's test) revealed credible associations between the severity of psychopathological symptoms and the score of 'Reading the Mind in the Eyes' test only. The following negative correlations between this ToM test scores and PANSS scales were found with positive symptoms P1 ($r=-0.628$, $p=0.005$), P3 ($r=-0.609$, $p=0.007$), negative symptoms - N1 ($r=-0.636$, $p=0.005$) and general symptoms-O6 ($r=-0.497$, $p=0.036$), O9 ($r=-0.625$, $p=0.006$) as well as with the total score of the psychopathological symptoms ($r=-0.510$, $p=0.030$). Thus, the analysis of tests showed that 'Reading the Mind in the Eyes' is the most sensitive to detecting ToM deficit in patients with the first psychotic episode.

DISCUSSION

Many researchers are actively using 'Hinting Task', 'Faux Pas', and 'Reading the Mind in the Eyes' tests for evaluation of ToM in the patients with a wide range of psychiatric problems (Baron-Cohen et al. 2001, Negrão et al. 2016, Scherzer et al. 2012, Sullivan et al. 2012, Varga et al. 2008). According to literature, patients with schizophrenia have impaired performance of all of the three tests compared to control groups (Baron-Cohen et al. 2001, Sullivan et al. 2012, Varga et al. 2008). For example, the patients do much worse in the verbal tasks 'Faux Pas' and 'Hinting Task' than the healthy subjects (Gurovich et al. 2016, Gurovich et al. 2014, Scherzer et al. 2012). At the same time, performance in the verbal 'Reading the Mind in the Eyes' test is rather heterogeneous – some sources state that patients' results are significantly worse (Hirao et al. 2008, Kettle et al. 2008, Wexler et al. 1998), while others state that they are comparable with control groups (Scherzer et al. 2012, Wexler et al. 1998). However, it is this non-verbal test that poses the greatest challenge for the healthy subjects compared to the other tasks (Wexler et al. 1998), which, perhaps, results in comparable scores in the above-mentioned studies.

Until now, the results of these tests have never been compared in the same patients. According to our results, these tasks show different sensitivity to ToM deficits. 'Reading the Mind in the Eyes' turned out to be the most sensitive out of the three in our study. Only this test results were significantly associated with the severity of psychopathological symptoms. The worse the

score of the test, the higher the scores of the positive PANSS scales (delusions and hallucinations), meaning that the psychopathological symptoms are more pronounced, which is comparable with the data of Bora et al. (2009). Thus, it was demonstrated that patients in remission with the minimal residual symptoms are more successful at this test than the subjects with a more acute psychosis (Bora et al. 2009). Furthermore, our data revealed a negative correlation between the test results and the negative symptoms severity (blunted affect), which is confirmed by Kelemen et al. (2005). Also, there were correlations with the general psychopathology scale (depression and bizarre thoughts).

According to our study, the patients have a more impaired non-verbal ToM component. The potential pathological mechanism may be the grey matter decrease, particularly in the left ventrolateral prefrontal cortex, which was associated with significantly less successful performance in 'Reading the Mind in the Eyes' task (Hirao et al. 2008).

CONCLUSION

Comparative analysis of the two verbal tests ('Faux Pas' and 'Hinting Task') and the non-verbal test ('Reading the Mind in the Eyes') showed that the latter is able to detect ToM deficit in the patients with the first episode of psychosis, whereas the other two either detect a non-significant impairment or do not detect any at all. 'Reading the Mind in the Eyes' test results depend on the severity of the psychopathological symptoms. However, the small number of subjects, and the inclusion of the several nosological groups of patients are the limitations of this study. More than half of the group consisted of the schizotypal disorder patients, so present data may only be characteristic for this diagnostic group. These issues are to be addressed in further research.

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Contribution of individual authors:

Alexandra Morozova carried out the main search and analysis of the project;

Zhanna Garakh carried out statistical analysis of the data, gave advice and drafted conclusions;

Marie Bendova contributed to the search and analysis of the project;

Yuliya Zaytseva suggested the project and carried out the clinical tests, supervised the development of the project, corrected the script and contributed to the analysis.

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Correspondence:

Alexandra Morozova, MD
Third Faculty of Medicine, Charles University in Prague
Prague, Czech Republic
E-mail: alexandramorozova1@gmail.com