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Theory of mind impairments in patients with deficit schizophrenia

Gábor Csukly*, Patrícia Polgár, László Tombor, Judit Benkovits, János Réthelyi

Department of Psychiatry Psychotherapy, Semmelweis University, 1083 Budapest, Hungary

Abstract

The deficit syndrome, a subgroup within schizophrenia, is characterized by enduring, idiopathic negative symptoms. Theory of mind (ToM), a domain of social cognition, is the ability of attributing mental states to ourselves and other people. ToM impairments have not been investigated earlier in deficit schizophrenia.

The aim of the present study was to examine ToM differences between patients with deficit (SZ-D) and non-deficit schizophrenia (SZ-ND). Gender differences were also investigated, and based on the literature a better ToM performance was expected in female patients.

The participants were 28 patients with SZ-ND, 30 patients with SZ-D, and 29 healthy control volunteers. The "Reading the Mind in the Eyes Test" was used to asses ToM deficits.

Control subjects outperformed both patient groups, while there were no significant differences between the two schizophrenia subgroups. In female subjects, both controls and patients with SZ-ND performed significantly better than the SZ-D subgroup. In male subjects, controls performed significantly better than both patient groups. The "diminished emotional range" and the "curbing of interest" items of the Schedule for the Deficit Syndrome showed significant negative relationship with the ToM score.

Our main finding is that female subjects with SZ-ND performed significantly better than female subjects with SZ-D.

1. Introduction

Impairments of social cognition are core deficits in schizophrenia. There is growing evidence that social cognition shows stronger correlation with functional outcome in schizophrenia than neurocognition [1]. Furthermore social cognition seems to mediate between neurocognitive deficits and everyday functioning [2–4].

The deficit syndrome, a subgroup of patients with schizophrenia, is hallmarked by enduring, idiopathic negative symptoms, including flattened affect, anhedonia, poverty of speech, curbing of interest, lack of sense of purpose, and diminished social drive. The listed symptoms manifest themselves during periods of clinical stability as well and are not secondary, due to depression, anxiety, medication side effects, positive symptoms, substance abuse, or psychosocial deprivation. The above diagnostic criteria are fulfilled by 15% of first-episode patients and 25%–30% of patients with chronic schizophrenia [5,6]. Patients with the deficit-syndrome suffer from increased severe long-term social and occupational disability [7], and have poor outcomes in terms of recovery [8]. Twenty five years after the first publication of the concept by Carpenter et al. [9], a substantial body of evidence supports the construct validity of the deficit syndrome as a pathophysiologically distinct disease subgroup [5,10].

Since emotion recognition, social cognition and their relations to neurocognition have been in the focus of schizophrenia research in the past decade (see a meta-analysis by Fett et al. 2011 [1]), only a few studies investigated the possible impairments of these domains in the deficit syndrome. In an earlier study no differences were found between deficit and non-deficit groups in terms of affect discrimination [11]. However, Cohen et al. [12] conducted a meta-analysis of 13 studies examining the neuropsychology of the deficit syndrome, and according to their results, deficit patients performed poorer on the social cognition domain when compared to non-deficit patients. In addition, in a recent publication Strauss et al. [13] reported that patients with deficit syndrome displayed significantly greater facial affect labeling and discrimination difficulties than non-deficit patients and controls. A possible explanation

* Corresponding author. Balassa 6, 1083, Budapest, Hungary. Tel.: +36 208250174; fax: +36 12100336.

E-mail addresses: csukly.gabor@med.semmelweis-univ.hu, csugab@yahoo.com (G. Csukly).

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of the negative results in the former study was the small number (n = 15) of subjects in the deficit group.

Theory of mind (ToM), an important domain of social cognition, is the ability to attribute mental states, such as intentions, beliefs, emotions, and so forth, to ourselves and other people and thereby to understand and predict behavior [14]. Impairments in ToM are well-known in schizophrenia (for reviews see Brune et. al. 2005 [15]; Bora and Pantelis 2013 [16]). There is growing evidence that ToM deficits are linked to negative symptoms: previous studies found that ToM deficits are significantly associated with psychomotor poverty [17] and overall negative symptoms [18–20], both in first episode and chronic schizophrenia [21]. In addition, some authors have argued for a distinction between cognitive and affective ToM [22]. According to their results, schizophrenia patients with high level of negative symptoms demonstrated a selective impairment in the affective ToM function, the ability to attribute affective mental states to others. In spite of the correlation between ToM and negative symptoms, ToM deficits have not been investigated yet in deficit schizophrenia.

In the present investigation we studied the differences between healthy control subjects, deficit and non-deficit schizophrenia in terms of theory of mind performance. We hypothesized that controls would outperform both patient groups, while, based on the above mentioned associations between negative symptoms and ToM, patients with deficit syndrome would perform worse in theory of mind tests than patients with non-deficit syndrome. Worse neurocognitive functioning is known in deficit syndrome. The rationale for using the "Reading the Mind in the Eyes Test" (RMET) was the relative independence of this test from higher order cognitive skills [23–25]. In order to confirm this previous finding, associations of ToM with neurocognitive measures were also explored in the present investigation. Previous studies reported that female sex in patients with schizophrenia is associated with better emotion discrimination [26–28], hence we expected better ToM performance in female patients relative to male subjects. Furthermore we expected better performance in the SZ-ND group in both genders relative to the SZ-D group. The rational for investigating these associations is to reach a better understanding of the cognitive profile of deficit patients.

2. Materials and methods

2.1. Participants

The participants were 58 patients with schizophrenia and 29 healthy control volunteers between 18 and 65 years (Table 1), a subpopulation of a larger sample from an investigation on neurocognition and genetics published earlier [29–31]. The diagnosis was based on the DSM-IV criteria [32], as confirmed by the Hungarian version of the MINI 5.0 diagnostic interview [33] and by information from the personal files of the patients (medical files were used for screening and DSM IV and MINI 5.0 for confirmation of the diagnosis). The diagnosis of schizophrenia and the deficit status of the patients were based on an agreement of an independent assessor and the treating clinician. Patients meeting the criteria for schizophrenia were further classified into the deficit (30 subjects) or the non-deficit group (28 subjects) using the Schedule for the Deficit Syndrome (SDS). The SDS is a semi-structured interview to assess six enduring and idiopathic negative symptoms: restricted affect, diminished emotional range, poverty of speech, curbed interest, diminished sense of purpose and diminished social drive. Patients are classified as having the deficit syndrome when they reach a moderate or higher level of severity on at least two of the above mentioned items [34].

The controls were also screened with the MINI interview. All patients were in a stabilized clinical state (there were no signs or symptoms of acute psychosis and PANSS Positive score was under 35) and were able to cooperate with the study protocol. Clinical symptoms were evaluated with the Positive and Negative Syndrome Scale (PANSS) [35]. Detailed demographic data can be found in Table 1. Further details of the neurocognitive measures and antipsychotic medications in the patient groups are provided in Tables 2 and 3 respectively. Exclusion criteria for patients and controls included age older than 65 years and younger than 18 years, comorbid neurological disease, head trauma, mental retardation, and substance abuse. Participation was voluntary and all subjects gave written informed consent. The study was carried out in accordance with The Code of Ethic of the World Medical Association (Declaration of Helsinki) for experiments involving humans, and it was approved by the Human Subjects Review Committee.

2.2. Procedures

2.2.1. Theory of mind (ToM): Reading the mind in the eyes test

In order to assess the capacity of mental state discrimination the Revised Version of the "Reading the Mind in the Eyes Test" (RMET) was used [25,36]. The RMET presents participants with 36 black-and-white photographs of the eye-region of the face, one at a time. Each photo shows the eye-region of a different actor or actress. Photographs are of equal size and depict equal number of male and female faces. Participants are asked to choose which of four words (one target and three foils), displayed on the screen, best describes the mental state of the actor/actress. A computerized version of the test was used in the experiment. Although the Eyes Test seems to be an emotion recognition paradigm, results from functional neuroimaging studies revealed test-related activation in brain areas related to ToM (dorsomedial prefrontal cortex and superior temporal cortex) [37,38], which is consistent with data from patients with autism-spectrum disorders who perform poorly on the Eyes Test [36,39]. This special feature of the task may be due to direct instructions to attribute mental states, the application of complex social emotions, and the presence of eye regions