Archives of Psychiatry and Psychotherapy, 2017; 4: 7–12

DOI: 10.12740/APP/79878

Emotion recognition and theory of mind in chronic schizophrenia: association with negative symptoms

Marta Andrzejewska, Paweł Wójciak, Klaudia Domowicz, Janusz Rybakowski

Summary

Aims: Assessing a relationship between the negative symptoms and deficits in emotion recognition and theory of mind as well as social functioning in patients with chronic schizophrenia.

Materials and Methods: Twenty patients with schizophrenia (10 male, 10 female) aged 36+11 years, with a mean duration of illness 13+9 years, were studied during an improvement period, stabilized on medications for at least 3 months. For the assessment of symptoms, the Positive and Negative Syndrome Scale (PANSS) and the Brief Negative Symptoms Scale (BNSS) were used. Emotion recognition was measured by the Facial Emotion Identification Test (FEIT), and theory of mind – by the Reading the Mind in the Eyes Test (R-MET). Patients' social functioning was evaluated by the Personal and Social Performance scale (PSP).

Results: Significant correlations were obtained between the negative symptoms of PANSS and BNSS, and the results of FEIT and R-MET. Association was observed between BNSS and FEIT for anhedonia, distress, asociality, avolition, blunted affect and alogia, and between BNSS and R-MET for distress, emotional blunting and alogia. Both PANSS and BNSS negative symptoms significantly correlated with the results of PSP.

Discussion: Our results correspond to those of recent studies showing priority of negative over positive symptoms in determining deficits in social cognition and functioning in chronic schizophrenia.

Conclusions: All domains of negative symptoms assessed by the BNSS correlated with deficits in emotion recognition and social functioning, and some domains correlated with the measure of theory of mind.

schizophrenia, negative symptoms, emotion recognition, theory of mind, social functioning

Introduction

Negative symptoms are a significant determinant of impairment in functioning and quality of life of schizophrenia patients and, generally, are not amenable to pharmacological interventions. In recent years, following the NIMH-MATRICS consensus statement on negative symptoms [1], new scales for the assessment of these symptoms have been introduced, of which the most popular is the Brief Negative Symptoms Scale (BNSS) [2].

Social cognition has been defined as the psychological processes that underlie social interactions, including perception, encoding, storage, retrieval and regulation of information about other people and about ourselves [3]. Among the most important domains of social cognition are emotion perception and theory of mind [4]. A relationship of these two domains of social cognition to clinical symptoms of schizophrenia has been extensively investigated, and their association with functional brain changes has

Marta Andrzejewska[1], Paweł Wójciak[1], Klaudia Domowicz[1], Janusz Rybakowski[1]: [1]Department of Adult Psychiatry, Poznan University of Medical Sciences, Poznan, Poland
Correspondence address: janusz.rybakowski@gmail.com

been reported [5]. According to Behere [6], deficits in facial emotion recognition may be considered a fourth psychopathological dimension of schizophrenia apart from positive, negative and cognitive symptoms.

In schizophrenia, significant impairments in emotion recognition and theory of mind have been observed [3, 7-10]. It has been suggested that deficits in these two domains are related to negative symptoms and cognitive impairment, and bear a strong relationship to functioning. Lysaker et al. [11] demonstrated that impaired social cognition was related to both intensity of negative symptoms and cognitive deficits. Browne et al. [4] showed that better social cognitive ability is related to lower intensity of negative symptoms. In these studies, social cognition covered both emotion perception and theory of mind. Leszczyńska [9] demonstrated that impairment in facial emotion perception corresponded with the severity of negative symptoms, whereas *Charernboo*n & Patumanond [10] showed, in a clinically stable population of schizophrenia patients, a correlation of negative symptoms with a test for emotion perception but not with a test for theory of mind.

Bell et al. [12] demonstrated that both social cognition and negative symptoms can determine real-world social outcomes and act as predictors of functional outcomes. Couture et al. [13] showed that theory of mind deficits mediated between social competence (such as motivation and other social skills) and social outcomes and that negative symptoms and social competence were correlated with functional outcomes. Kalin et al. [14] found that social cognition, social competence and negative symptoms explain 32% of variance in real-world social outcomes.

The aim of this study was to assess the relationship between negative symptoms and deficits in emotion recognition and theory of mind in patients with chronic schizophrenia. For the assessment of negative symptoms, in addition to a classic Positive and Negative Syndrome Scale (PANSS), we employed a new scale, the Brief Negative Symptom Scale (BNSS). We were also interested in how negative symptoms and deficits in social cognition relate to the real-world functional outcomes as assessed by the Personal and Social Performance scale (PSP).

METHOD

Participants

The study was performed on 20 patients with schizophrenia (10 male, 10 female), aged 36+11years. Consensus diagnosis by at least two psychiatrists was made for each patient, according to DSM-IV criteria (SCID) [15]. The mean duration of illness was 13+9 years and the mean number of years in education was 13+3. Patients were studied during an improvement period, when the mean total PANSS score was 52+12; 12+3 on positive symptoms and 15+7 on negative symptoms. They had been on stable antipsychotic medication for at least 3 months before the study.

The study was approved by a bioethics committee, and all participants gave their informed consent after the nature of the procedures had been fully explained to them.

Psychometric assessments

The Positive and Negative Syndrome Scale (PANSS)

PANSS was developed by Kay et al. [16]. It is a 30-item rating scale specifically developed to assess patients with schizophrenia. It is divided into three subscales, a positive scale with seven positive symptoms (P1-P7), a negative scale with seven negative symptoms (N1-N7) and a general psychopathology scale with 16 items (G1-G16). Psychopathology severity is defined as 1 = absent; 2 = minimal; 3 = mild; 4 =moderate; 5 = moderate–severe; 6 = severe; 7 = extreme.

The Brief Negative Symptoms Scale (BNSS)

BNSS was developed by Kirkpatrick and colleagues [2]. The scale defines negative symptoms as an absence or decrease in behaviors and subjective experiences that are normally present in a person from the same culture and age group. The scale has 13 items organized into 6 subscales: anhedonia (intensity and frequency of pleasure, intensity of expected pleasure), distress (subject's experience of unpleasant or distressing emotion of any kind, such as sadness, depression, anxiety, grief, anger), asociality (reported as reduced social activity accompanied by decreased interest in forming close relationships with others –

behavior, internal experience), avolition (reported as a reduction in the initiation of and persistence in activity – behavior, internal experience), blunted affect (which refers to a decrease in the outward expression of emotion – facial expression, vocal expression, gestures), and alogia (reported as poverty of speech – quantity of speech, spontaneous elaboration of speech).

The examination is of an interview nature, based on a manual including, among other things, prompts and suggested questions. All items are rated on a 7-point scale (0–6), with anchor points ranging from a symptom being absent (0) to severe (6). The time frame for the ratings is one week. The basis for the interview is provided by the patient – participant observation also constitutes an important element – or, if needed, data obtained from external sources. The Polish version of all the documents of this scale (worksheet, workbook, manual) has been elaborated in the Department of Adult Psychiatry, Poznan University of Medical Sciences, and the translation and back translation of these were confirmed by the authors of the scale, Brian Kirkpatrick and George Strauss.

Assessment of social cognition

Facial Emotion Identification Test (FEIT)

The test was developed by Kerr and Neale [17]. It consists of a slideshow containing 19 black and white photographs of faces showing various expressions of emotion. The photographs contain six main emotions (joy, sorrow, anger, disgust, fear, surprise). The subject is given a 19-item response key in which the 6 emotions are listed for each question. The subject is asked to mark which emotion best matches each photograph. One point is given for each correct answer and 0 for incorrect answers. The maximum possible score is 19.

The Reading the Mind in Eyes Test (R-MET)

The revised version of R-MET was developed by Baron-Cohen et al. [18] and consists of 36 photos presenting the eyes and their adjacent areas. The subject is asked to choose one of the four terms which best describes what the person in the picture is thinking or feeling. This test detects individual differences in social sensitivity (theory of mind).

Assessment of social functioning

The Personal and Social Performance scale

The Personal and Social Performance scale (PSP) evolved on the basis of the social functioning component of the DSM-IV Social and Occupational Functioning Assessment Scale (SOFAS) as an effort to assess social functioning in schizophrenia. It is being proposed as an improvement over the Global Assessment of Functioning (GAF) scale and SOFAS. PSP is a 100-item scale, divided in 10 similar intervals. The score is based on the assessment of a patient's performance in four categories: socially useful activities, personal and social relationships, self-care, disturbing and aggressive behavior. PSP provides a score between 1 and 100, divided into 10 equal intervals to rate the degree of difficulty. Higher scores represent better personal and social functioning [19].

STATISTICS

The calculations were performed using the Statistica (StatSoft-Poland) version 10 statistical package. The level of statistical significance was determined at $p<0.05$. The Shapiro–Wilk test was used to check the distributions. Since the data were consistent with a normal distribution, the Pearson test was used to determine correlation between variables.

RESULTS

The correlations between PANSS positive and negative symptoms and the results of emotion recognition and theory of mind tests as well as the PSP scale are shown in Table 1.

Table 1. Correlations between PANSS positive and negative symptoms and the results of emotion recognition and theory of mind tests

	FEIT	R–MET	PSP
PANSS P1 Delusion	0.037	0.319	–0.413
PANSS P2 Conceptual disorganization	–0.660**	–0.479*	–0.661**
PANSS P3 Hallucinatory behavior	–0.311	0.099	–0.595**
PANSS P4 Excitement	–0.403	–0.383	–0.189
PANSS P5 Grandiosity	0.257	0.196	–0.138
PANSS P6 Suspiciousness	–0.241	0.028	–0.508**
PANSS P7 Hostility	0.004	0.320	–0.036
PANSS N1 Blunted affect	–0.630**	–0.495*	–0.640**
PANSS N2 Emotional withdrawal	–0.613**	–0.421	–0.835***
PANSS N3 Poor rapport	–0.596**	–0.612**	–0.562**
PANSS N4 Social withdrawal	–0.563**	–0.314	–0.800***
PANSS N5 Difficulty in abstract thinking	–0.608**	–0.442	–0.481*
PANSS N6 Lack spontaneity	–0.673**	–0.580**	–0.694***
PANSS N7 Stereotyped thinking	–0.734***	–0.671**	–0.648**

*p<0.05, **p<0.01, ***p<0.001

FEIT, Facial Emotion Identification Test; R-MET, Reading Mind in the Eyes test; PSP, Personal and Social Performance Scale; PANSS, Positive and Negative Syndrome Scale.

Significant correlations were obtained between all items of PANSS negative symptoms and the results of the FEIT and PSP, and between four of PANSS negative items and the R-MET. Out of the PANSS positive symptoms subscale, correlation with FEIT and R-MET was achieved for cognitive disorganization, and with PSP, additionally, for hallucinatory behavior and suspiciousness.

Correlations between the negative symptoms of the BNSS and the results of emotion recognition and theory of mind tests as well as the PSP scale are shown in Table 2.

Table 2. Correlations between negative symptoms of the BNSS and the results of emotion recognition and theory of mind tests

	FEIT	R–MET	PSP
BNSS 1 Intensity of pleasure during activities	–0.418	–0.269	–0.761***
BNSS 2 Frequency of pleasure during activities	–0.507*	–0.327	–0.838***
BNSS 3 Intensity of expected pleasure from future activities	–0.517*	–0.289	–0.739***
BNSS 4 Distress	–0.738***	–0.697***	–0.789***
BNSS 5 Asociality: behavior	–0.578**	–0.371	–0.877***
BNSS 6 Asociality: internal experience	–0.585**	–0.417	–0.751***
BNSS 7 Avolition: behavior	–0.626**	–0.406	–0.898***
BNSS 8 Avolition: internal experience	–0.555**	–0.346	–0.906***
BNSS 9 Facial expression	–0.628**	–0.556**	–0.798***
BNSS 10 Vocal expression	–0.758***	–0.588**	–0.843***
BNSS 11 Expressive gestures	–0.717***	–0.508**	–0.876***
BNSS 12 Quantity of speech	–0.687***	–0.519**	–0.794***
BNSS 13 Spontaneous elaboration	–0.699***	–0.498**	–0.849***

*p<0.05, **p<0.01, ***p<0.001

BNSS, Brief Negative Symptom Scale; FEIT, Facial Emotion Identification Test; R-MET, Reading the Mind in the Eyes Test; PSP, Personal and Social Performance Scale; PANSS, Positive and Negative Syndrome Scale.

Significant correlations were obtained between all but one item of the BNSS negative symptoms subscale and FEIT, and between six BNSS items from the distress, emotional blunting and alogia subscales and the R-MET. Significance with FEIT was observed on all BNSS subscales: anhedonia ($r= –0.498$, $p<0.05$), distress ($r=–0.738$, $p<0.001$), asociality ($r=–0.594$, $p<0.01$), avolition ($r=–0.597$, $p<0.01$), blunted affect ($r=–0.724$, $p<0.001$), and alogia ($r=–0.700$, $p<0.001$).

All BNSS items scores significantly correlated with the results of PSP. A significant correlation was also found between the FEIT and PSP scales ($r=0.682$, $p<0.001$), whereas a correlation between R-MET and PSP did not reach statistical significance ($r=0.423$, $p>0.05$).

DISCUSSION

The main finding of this study is showing, in stable patients with chronic schizophrenia, a significant correlation between the intensity of negative symptoms, assessed by a classic PANSS as well as a novel BNSS scale, and both emotion recognition, assessed by FEIT, and theory of mind, assessed by R-MET. The most conspicuous result is a robust association between all subscales of the BNSS scale and FEIT, the test measuring emotion recognition. It seems that given such a magnitude of association, it would be premature to postulate facial emotion recognition as a fourth psychopathological dimension of schizophrenia, as suggested by Bechere [6]. Correlations were also obtained between the BNSS and the R-MET, measuring theory of mind. However, in contrast to FEIT, they included only three subscales: distress, emotional blunting and alogia. Therefore it seems that such negative symptoms domains as anhedonia, asociality and avolition are not significantly associated with performance on the theory of mind test. Finally, all 7 negative symptoms of the PNSS and all 13 negative symptoms of the BNSS significantly correlate with social functioning as assessed by the PSP scale.

Using the PANSS scale, a significant association was obtained between both tests of social cognition with only one out of seven items of positive symptoms, i.e. cognitive disorganization, and additionally, hallucinatory behavior, correlated with social functioning assessed by the PSP. This may confirm the results of previous studies showing a weaker relationship between positive than negative symptoms and social cognition and functioning. Rabinowitz et al. [20], when analyzing the CATIE study data, showed that negative symptoms have a greater impact on functioning than positive symptoms. In a recent study by Bliksted et al. [21], which included patients with first-episode schizophrenia, high levels of negative symptoms were associated with poor social cognition while the effect of positive symptoms on social cognition was mediated by the presence of negative symptoms.

Limitations and conclusions

The main limitations of the study include a small number of patients and using only one test for each domain of social cognition. Furthermore, patients were assessed during improvement period, when the intensity of positive symptoms was small; this might have reduced their impact on social cognition and functioning. On the other hand, some of the strengths of the study are a careful selection of patients stabilized on antipsychotic medication and using a modern scale for the assessment of negative symptoms.

In summary, our results confirm that all domains of negative symptoms make a robust determinant of deficits in emotion recognition and of social functioning. Additionally, some domains of negative symptoms show an association with a measure of theory of mind.

REFERENCES

1. Kirkpatrick B, Fenton WS, Carpenter WT, Marder SR. The NIMH-MATRICS consensus statement on negative symptoms. Schizophr Bull. 2006; 32(2): 214–219.
2. Kirkpatrick B, Strauss GP, Nguyen L, Fisher BA, Daniel DG, Cienfuegos A, et al. The Brief Negative Symptom Scale: Psychometric properties. Schizophr Bull. 2011; 37: 300–305.
3. Green MF, Horan WP, Lee J. Social cognition in schizophrenia. Nat Rev Neurosci. 2015; 16: 620–631.

4. Browne J, Penn DL, Raykov T, Pinkham AE, Kelsven S, Buck B, et al. Social cognition in schizophrenia: factor structure of emotion processing and theory of mind. Psychiatry Res. 2016; 242: 150–156.
5. Jáni M, Kašpárek T. Emotion recognition and theory of mind in schizophrenia: a meta-analysis of neuroimaging studies. World J Biol Psychiatry. 2017, May 30. doi:10.1080/15622975.2017.1324176.
6. Behere RV. Facial emotion recognition deficits: the new face of schizophrenia. Indian J Psychiatry. 2015; 57: 229–235.
7. Wiener D, Andrzejewska M, Bodnar A, Rybakowski J. Disturbances of theory of mind and empathy in schizophrenia and bipolar affective illness [in Polish]. Neuropsychiatry Neuropsychol. 2011; 6: 85–92.
8. Savla GN, Vella L, Armstrong CC, Penn DL, Twamley EW. Deficits in domains of social cognition in schizophrenia: a meta-analysis of the empirical evidence. Schizophr Bull. 2012; 39: 979–992.
9. Leszczyńska A. Facial emotion perception and schizophrenia symptoms. Psychiatr Pol. 2015; 49: 1159–1168.
10. Charernboon T, Patumanond J. Social cognition in schizophrenia. Ment Illn. 2017; 9: 7054.
11. Lysaker PH, Gumley A, Luedtke B, Buck KD, Ringer JM, Olesek K, et al. Social cognition and metacognition in schizophrenia: evidence of their independence and linkage with outcomes. Acta Psychiat Scand. 2013; 127: 239–247.
12. Bell MD, Corbera S, Johannesen JK, Fizdon JM, Wexler BE. Social cognitive impairments and negative symptoms in schizophrenia: are there subtypes with distinct functional correlates? Schizophr Bull. 2011: 186–96.
13. Couture SM, Granholm EL, Fish SC. A path model investigation of neurocognition, theory of mind, social competence, negative symptoms and real-world functioning in schizophrenia. Schizophr Res. 2011; 125: 152–160.
14. Kalin M, Kaplan S, Gould F, Pinkham A, Penn D, Harvey PD. Social cognition, social competence, negative symptoms and social outcomes: inter-relationships in people with schizophrenia. Psychiatry Res. 2015; 68: 254–260.
15. First MB, Spitzer RL, Gibbon M, Williams J. Structured Clinical Interview for DSM-IV Axis I Disorders. Clinician Version (SCID-CV). Washington, DC: American Psychiatric Press; 1996.
16. Kay SR, Fiszbein A, Opler LA. The positive and negative syndrome scale (PANSS) for schizophrenia. Schizophr Bull. 1987; 13: 261–276.
17. Kerr SL, Neale JM. Emotion perception in schizophrenia: specific deficit or further evidence of generalized poor performance? J Abnorm Psychol. 1993; 102: 312–318.
18. Baron-Cohen S, Wheelwright S, Hill J, Raste Y, Plumb I. The 'Reading the Mind in the Eyes' Test revised version: a study with normal adults, and adults with Asperger syndrome or high-functioning autism. J Child Psychol Psychiatry. 2001; 42: 241–251.
19. Morosini PL, Magliano L, Brambilla L, Ugolini S, Pioli R. Development, reliability and acceptability of a new version of the DSM-IV Social and Occupational Functioning Assessment Scale (SOFAS) to assess routine social functioning. Acta Psychiatr Scand. 2000; 101: 323–329.
20. Rabinowitz J, Levine SZ, Garibaldi G, Bugarski-Kirola D, Berardo CG, Kapur S. Negative symptoms have greater impact on functioning than positive symptoms in schizophrenia: analysis of CATIE data. Schizophr Res. 2012, 137: 147–150.
21. Bliksted V, Videbech P, Fagerlund B, Frith C. The effect of positive symptoms on social cognition in first-episode schizophrenia is modified by the presence of negative symptoms. Neuropsychol. 2017; 31: 209–219.