

Facial emotion perception and schizophrenia symptoms

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Summary

Aim. Emotion recognition is an important aspect of social interactions. Patients suffering from schizophrenia exhibit some disturbances in affective processing. The aim of the study was the evaluation of facial emotion perception and its relation to the psychotic symptoms in schizophrenia patients.

Methods. 102 patients with schizophrenia (F20.0, ICD-10) and 50 healthy volunteers participated in the study; all the subjects were 18–60 years old. Psychical condition was assessed with following diagnostic tools: CGI (Clinical Global Impression Scale), PANSS (Positive and Negative Syndromes Scale), CDSS (Calgary Depression Scale for Schizophrenia), UKU (Side Effect Rating Scale). Facial emotion recognition ability was assessed by SIE-T (Emotional Intelligence Scale – Faces).

Results. On the basis of gathered data it was found that patients suffering from schizophrenia performed worse on facial emotion recognition task compared to the healthy subjects. Severity of negative symptoms corresponded with the facial emotion perception impairment. There was no relation found between age of schizophrenia-onset and level of the facial emotion perception impairment, but the facial emotion recognition ability was worsening with the age of the subjects, both healthy and suffering from schizophrenia.

Conclusions. Severity of schizophrenia corresponded with the facial emotion perception impairment.

Key words: schizophrenia, facial expression, symptoms

Introduction

Emotion recognition is an important aspect of social interactions. According to the studies, subjects suffering from schizophrenia exhibit some disturbances in affective processing [1–14], nonetheless they do experience emotions very intensively [14].

Deficits in the facial emotion perception were also found in patients' relatives and individuals with high-risk of developing psychosis [14, 15]. Facial emotion recognition is essential for personal interaction. Disturbances in facial emotion perception may significantly influence communication with other people and bother the everyday activity. False emotion recognition and its interpretation may lead to misunderstanding of situation, cause anxiety and fear, which may indirectly lead to an increase of the psychotic symptoms. Disturbances in recognition and expression of emotional states may significantly affect personal interactions and social functioning in family life, education and work.

Schizophrenia patients have difficulties in recognising emotions when they are presented both very intensively as well as very softly. It is different in healthy people, where more intensive facial expressions can lead, not as in the case of facial expressions of low intensity to false recognition of face as neutral, but to assigning quite different emotions to the face [6]. Schizophrenia patients recognise faces and age easier than emotions. The opposite situation is observed in healthy people, especially regarding faces presenting negative emotions [16]. However, in both healthy and schizophrenia populations older people have more problems with facial emotion recognition, especially regarding the anxiety faces [7, 17].

It is also supposed that there is some relation between facial emotion perception, memory and abstract thinking. The disturbances in facial emotion perception in patients with schizophrenia may be rather an effect of some global impairment than any specific one focused selectively on the facial emotion perception. The problem may occur at different levels, for example, during information extraction, decoding process of the visual information, attributing the emotion or attention disturbances etc. [1, 3, 10, 18]. Certain neurons of the visual cortex, fusiform gyrus and superior temporal gyrus are engaged in the facial emotion recognition process. The other locations are dorsomedial frontal cortex, important for mentalisation, cingulate cortex, insular cortex and hippocampus [19–23]. In functional studies with emotion differencing between positive and negative faces the firing of amygdala neurons was observed during the task in healthy group, while in schizophrenia group the neural activity in this region was lower [19].

Aim

The aim of this study was the evaluation of the facial emotion perception in paranoid schizophrenia patients during the psychotic episode.

Material and method

102 in-patients of Institute of Psychiatry and Neurology diagnosed with paranoid schizophrenia (F20.0, according to ICD-10) and 50 healthy volunteers participated

in the study. All the participants were between 18 and 60 years old. Every participant was informed about the aim of the study and the method. All basic socio-demographic data were gathered during an interview (age, sex, age of onset, duration of the illness, number of hospitalisations, education level, occupation). In-patients were also asked about their current medication. All the subjects were asked about any potential neurological or somatic disorders, and any drug consumption. Subject with the history of current active alcohol, tranquillisers or any other drug abuse were excluded from the study. A psychological condition was assessed with following diagnostic tools: CGI (Clinical Global Impression Scale), PANSS (Positive and Negative Syndromes Scale), CDSS (Calgary Depression Scale for Schizophrenia), UKU (Side Effect Rating Scale). Facial emotion recognition ability was assessed by SIE-T (Emotional Intelligence Scale – Faces; Matczak et al. 2005). The SIE-T test consists of 18 pictures presenting faces of man or woman and every photograph is accompanied by 6 different emotions. The subject is asked to choose which of the given emotions are presented on the picture. Every correct answer is scored with 1 point that means that the higher the score the better is the facial emotion recognition as well as the lower score may indicate some facial emotion recognition disturbances. The study was in the form of interview and tests. The participation was free and subjects could refuse to participate at any time. The study was approved by the Bioethical Committee of the Institute of Psychiatry and Neurology.

All statistical analyses were computed using package Statistica for Windows. Most of scales used in the study were ordinal and not all distributions of the variables were normal, so nonparametric statistical tests were used: Spearman's rank correlation coefficient and Mann-Whitney U test or Wilcoxon signed-rank test. To exclude the influence of one variable the linear regression analysis was used. The Student's t-test was used to assess significant differences. All results at p level < 0.05 were considered significant.

Results

The study group included 102 patients and the control group – 50 healthy volunteers. 46% of the study group (47 subjects) were women, so the group was balanced in respect of sex (CI 95%: 41%–51%). The majority of the subjects finished secondary school. 46% (47 subjects) worked or studied (CI 95%: 41%–51%).

In the control group there were slightly more women: 58% (29 subjects; CI 95%: 51%–65%). The majority of the subjects of this group had higher education. All the subjects in the control group worked or studied. The subjects in this group were slightly older than the subjects in the group of patients, and a difference was statistically significant. Moreover, there were more women than men in this group; however, the difference was statistically insignificant. In control group the women were significantly older than the men ($t = 2.295$; $p = 0.022$), and had lower level of education ($t = 2.123$; $p = 0.034$).

The patients had lower level of education than the healthy volunteers; the difference was slight and adequate corrections were taken into consideration in further analyses. All the differences were included in the statistical analysis. Most of the patients (84%) were medicated with atypical neuroleptics, including 5 patients who were taking clozapine. Majority of medications were administered orally; only 16% of patients were treated with long-acting injectable antipsychotics. Average dose of the neuroleptic was 337 mg (+/- 156 mg) chlorpromazine equivalents [5]. There was a significant correlation between severity of the pharmacotherapy side effects according to the score on the UKU scale and severity of the negative symptoms (N) assessed by PANSS (Sp.RC = 0.246; $p = 0.014$). Subjects suffering from schizophrenia performed worse on the facial emotion recognition task compared to the healthy group, and the difference was significant ($t = 4.9041$; $p = 9.382 \text{ e-}007$). In the healthy group the facial emotion recognition correlated with the education level (Sp.RC = 0.308; $p = 0.031$) and the age of the subject negatively correlated with the SIE-T score (Sp.RC = -0.405; $p = 0.005$); it is presented in Table 1.

Table 1. Correlations between facial emotion recognition (SIE-T score) and social variables

	Healthy subjects		Schizophrenia subjects	
	Sp. R. C.	p	Sp. R. C.	p
Age	-0.405	0.005**	-0.22	$p = 0.030^*$
Education	0.308	0.031*	0.164	0.100 NS

Sp. R.C. – Spearman's rank correlation coefficient; NS – not significant; *correlation significant at the level of $p < 0.05$; ** correlation significant at the level of $p < 0.01$

In the schizophrenia group, a significant negative association was found between the facial emotion recognition, the duration of the illness and the number of hospitalisations. Facial emotion recognition ability was deteriorating with age (the older people scored lower in SIE-T test). However, there was no relation between the facial emotion perception ability and the age of schizophrenia-onset.

Moreover, the significant negative correlations between the severity of schizophrenia symptoms measured with CGI and PANSS (negative symptoms – N and general symptoms – G) and the facial emotion recognition score in SIE-T were observed. On the other hand no significant influences of depressive symptoms (CDSS) or pharmacotherapy side effects (UKU) in the SIE-T test were found, which is presented in Table 2.

Table 2. Correlations with scores in facial emotion recognition test (SIE-T score) in schizophrenia group

	Sp. R. C.	p
Age of the onset	-0.015	0.879 NS
Illness duration	-0.287	0.004 **
Number of hospitalisations	-0.263	0.008 **

table continued on the next page

CGI	-0.325	0.001**
PANSS	-0.308	0.002**
P	-0.114	0.252 NS
N	-0.347	0.00048 ***
G	-0.269	0.0068 **
CDSS	0.032	0.745 NS
UKU	0.002	0.985 NS

Sp. R.C. – Spearman’s rank correlation coefficient; NS – not significant; *correlation significant at the level of $p < 0.05$; ** correlation significant at the level of $p < 0.01$

In schizophrenia patients group, subject who were active, i.e. studying or working subjects, achieved better scores in facial emotion recognition test (SIE-T), which is presented in Table 3.

Table 3. **Comparison of scores in facial emotion recognition test (SIE-T) achieved by active (working/studying) and inactive subjects in schizophrenia group (Wilcoxon test (Mann-Whitney U Test)**

	Active subjects		Inactive subjects		p
	mean	median	mean	median	
SIE-T	70.23	70	62.98	63	0.00045 ***

*** correlation significant at the level of $p < 0.001$

Discussion

On the basis of gathered data it was found that the subjects suffering from schizophrenia performed significantly worse in the facial emotion recognition task (SIE-T) compared to the healthy subjects. The findings are comparable with other studies, even though the different tests and instruments were used there [1–3, 5–12]. Furthermore, the severity of schizophrenia, especially the negative symptoms, correlated positively with the facial emotion perception impairment. The findings are in line with some previous studies [1, 4, 6, 10, 26]. Although there was a significant correlation between the severity of the pharmacotherapy side effects and the negative symptoms, no influence of the pharmacotherapy side effects on the facial emotion recognition ability was observed. There was no significant relation between the severity of depressive symptoms and facial emotion recognition in this study, however, in general the severity of the depressive symptoms in this group was minimal (mean score was 2.19 on CDSS), and any potential correlation might be difficult to observe. Nonetheless, such correlation was found in some other studies [8, 27, 28]. Some differences between the male and the female subjects are also worth

mentioning. In the schizophrenia patients group, the men comparing to the women were slightly younger (mean age was 31.31 for men, and 38.23 for women) and they were also younger at the illness onset (mean age of onset for men was 22.95 and for women was 27.96). The men also had lower education level than the women. All these differences were statistically significant. In both groups, of healthy controls and patients suffering from schizophrenia, no significant differences in the facial emotion recognition ability between the men and the women were observed. The findings are comparable with the studies of the other authors [1, 7, 10]. Also some other significant relation in the schizophrenia group was found, that is between the facial emotion recognition and duration of the illness and number of hospitalisations: the longer was the illness duration the worse was the performance in the facial emotion recognition test (SIE-T). But what have to be taken in consideration is the age of the subject, that is to say, with age the ability of the facial emotion recognition is worsening, what was confirmed also in this study [7]. Patients with schizophrenia tend to misread emotions, but it seems that the disturbances concern rather specificity than sensitivity [6, 17]. Such mistakes may promote delusions and withdrawal. In studies where emotion differentiation was assessed it was found that people with schizophrenia are likely to recognise neutral faces as negative, for example, as sad, expressing disgust, fear or anger. Also patients in remission, more often than healthy people, recognise disgust or fear and seldom happiness and anger on neutral faces, and happy faces were most often recognised as neutral [6, 12, 21]. In different study it was found that men with schizophrenia more often than women recognise neutral faces as angry (25% and 5% respectively), while women more often recognise them as sad (53% and 38% respectively) [18].

In paranoid schizophrenia group, subject who were active i.e. studying or working subjects, that is people whose social functioning was quite well achieved better scores in facial emotion recognition test than subject who were not working or studying.

Facial emotion recognition influences social functioning of both healthy people and those suffering from schizophrenia in aspects such as holding different kinds of interpersonal relations or successful verbal and nonverbal communication [29, 30]. But there is also other study where no relation between facial emotion recognition and social functioning was found [4]. On the other hand, working or studying may be a real indicator of patient's way of functioning in his/her life. The obtained data suggest that the social functioning in schizophrenia is better when the subjects have no more than tiny problems in facial emotion recognition and consistently sufficient nonverbal communication abilities.

Due to the concept of development of social cognition it might be expected that there is some relation between facial emotion perception ability and the age of schizophrenia-onset, but no such trend was observed in this study. In Kohler's meta-analysis (2010) it was found that the factor which influences the facial emo-

tion recognition was the severity of the illness and not its duration [7]. Moreover, severity of the psychotic symptoms also influences the cognitive symptoms such as attention, memory, vigilance, and broadly understood thinking, and any disturbances in these areas may be a part of the illness. It is hard to definitely separate cognitive, perception and emotion processes, since they simply overlap, influence and interfere with each other, and this fact needs to be taken in consideration before drawing any conclusions [12, 31]. While working on any test which assesses the facial emotion perception ability the range of cognitive processes is involved, i.e. ability to understand the text of the task and its instruction, a way of choosing the right answer and also ability to see and understand logical consequences, and all these may be impaired on the cognitive level during the episode of the psychosis. As the facial emotion perception impairment is present also in patients pharmacologically naïve it may suggest that neuroleptics have no influence on facial emotion recognition [26, 32, 33]. There were no significant differences between patients treated with haloperidol, clozapine, risperidone, quetiapine or olanzapine and no dose dependent differences were found either [7, 10, 34–37]. On the other hand, there are some interesting data showing positive effect of the nonpharmacological methods such as training on facial emotion recognition ability. It indicates the essential role of the rehabilitation and psychotherapy in treating patients with schizophrenia [38].

And last but not least, all the results of presented study are based on the particular and selected group of people suffering from paranoid schizophrenia. The patients with schizophrenia were admitted to the hospital on their own will and they gave their permission to the therapy and then to the participation in the study, and they were expected to give an active performance during the tests. The analysed data were obtained from people who were able to finish the whole examination set which included the interview and the tests. What is easy to understand, all the subjects who, due to the severe psychotic symptoms, were not able to recognise the aim of the study or were not aware of their agreement for any participation, were excluded from the study. Additionally, there are also no data of the subjects who did not agree to take part in the study or did not meet the inclusion criteria, so all these limitations have to be taken in consideration.

Conclusions

1. Patients suffering from schizophrenia performed significantly worse on facial emotion recognition.
2. The ability of facial emotion recognition was worsening with the age of the subjects, in both healthy and schizophrenia group.
3. The significant correlation between severity of schizophrenia, especially negative symptoms, and the facial emotion recognition impairment was found.

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