Disintegration of social cognitive processes in schizophrenia

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Summary

Despite rapid development of research on social cognition (SC) impairments in schizophrenia, efforts are still made to generate new, broader theoretical models which include the neural network approach to those dysfunctions. The aim of this study was the evaluation of the structure of SC in patients with schizophrenia in comparison to healthy subjects.

Methods. The studied groups consisted of 55 subjects: 30 patients with paranoid schizophrenia according to DSM-IV criteria, and 25 control healthy subjects matched for age, gender and education to the clinical group. In order to assess processes of SC, a battery of tests was administered: Theory of Mind Picture Stories to assess theory of mind, trials "Faces" (from Ekman and Friesen's set of emotional expressions) and "Figures" (from the publication by Argyle) to evaluate recognition of emotions from facial and gesture expression. The methods included also an assessment of self-criticism (insight) relating to the subject's processes of SC.

Results. The level of efficacy of SC was lower in the patients compared to the controls. In the clinical group, theory of mind was the most important factor for the overall level of SC and its impairments. There was inadequate, decreased patients' self-criticism regarding their execution of SC tests. The insight did not correlate with any other SC variables in the clinical group. In general, the group characterized by lower integration of social cognitive processes, also obtained lower scores in individual dimensions of SC.

Conclusions. The structure of social cognitive processes in schizophrenic group, unlike in healthy subjects, shows characteristics of generalized disintegration.

Key words: schizophrenia, social cognition, disintegration, neural networks, theory of mind

Introduction

Since the earliest concepts of schizophrenia were formed, the hypothesis linking the disease with disorganisation of mental processes has played a significant role. First, such terms as intrapsychic ataxy or a dissociation of affective and cognitive processes (Stransky, 1905), sejunction (the fragmentation of consciousness along with simultaneous series of associations becoming autonomous) (Gross, 1904) or associative splitting (Bleuler, 1911) should be mentioned [1]. In the monograph on

the psychology of schizophrenia, Gruhle [2] quoted some metaphors capturing the essence of the disorder. For instance, hypothetical processes underlying schizophrenia were compared to "orchestra without a conductor" (Kraepelin) or "a machine without fuel" (Chaslin). Subsequent attempts to explain disorders observed in schizophrenia contributed to the development of the concept of schizotaxia [3, 4].

Those early observations on the causes of schizophrenia fit squarely into current trends in research on brain functioning where particular emphasis is placed on description of structural and functional relationships between the whole neural regions, centres or populations and brain functional systems.

The contemporary understanding of pathophysiological mechanisms of schizophrenia connected with disorganization in function of specific neural circuits, and consequently of mental processes, dates back to the work of Andreasen on cognitive dysmetria [5]. This theory posits dysregulation of activity in cortical-cerebellar-thalamic-cortical circuitry (CCTCC), responsible for i.a. selecting information, caused by disrupted communication between neurons at the synaptic level. In 1995 Friston and Frith [6] presented the disconnection hypothesis in schizophrenia that proposed abnormalities in functional, but not anatomical, connections. At this point, their theory converges with the glutamatergic theory of schizophrenia [7] and the hypothesis of dopamine dysregulation [8]. Increasingly advanced neuroimaging techniques have provided support for the disconnection hypothesis, both in the structural and functional dimension [9].

Dysfunction of neural circuits and networks may thus account for numerous symptoms characteristic of schizophrenia. The theory of dysmetria has been confirmed by over 30-year intense research on cognitive dysfunction in schizophrenia, which has clearly shown that the abnormalities observed cannot be explained by changes in functions of a single brain region, but by disrupted integration of neural networks responsible for sensory, cognitive and affective processes [10].

Functional and structural analysis of neural networks in healthy brains contributes to better understanding of abnormalities in neural network connectivity in schizophrenia. For example, the research on so-called 'Default Mode Networks' (DMN) revealed deficits in white matter anatomy, but also complex functional alterations in DMN subsystems in schizophrenia patients when compared to healthy controls [11].

Studies searching for network structures also involve social cognition, one of eight fundamental dimensions of cognitive deficits in schizophrenia [12], focusing largely on anatomical connections [13], and to a lesser degree on functional connectivity [14].

The complex nature of social cognition is best reflected in the description given by Beer and Ochsner in 2006 [15] presenting the network of interconnections between various functions employed for SC modelling. In their overview on the nature of SC, the authors offered the following definition: "social cognition is defined as the perception of others, the perception of self, and interpersonal knowledge. The basic cognitive processes in social cognition involve the perception of a social stimulus (the self, other people or the interaction of the two) in varying degrees of complexity. Later stages of elaboration integrate basic perceptions with contextual knowledge and, finally, involve representations of possible responses to the situation".

The study on deficits of social cognition in patients with acquired brain injury conducted by Krukow [16] also lends support for network organization of the neuronal basis of regulation of social functioning.

The 1990s saw an explosion of interest in SC in schizophrenia. Much of the research on the subject has tended to explore its domains [17, 18] and the specific functions (e.g. ToM, emotion perception) in the modular aspect, i.e. in terms of effectiveness or impairment of a given function [19-21]. Considering network models explaining dysfunctions, e.g. attention deficits in schizophrenia, the analysis of separate SC domains seems to oversimplify the phenomena observed and therefore making it impossible to fully comprehend and elucidate the involved impairments.

Taking into account:

1. a marked trend shift in research on brain functioning from the assumption that specific cognitive functions are attributed to single brain regions to the description of these functions that includes interactions of numerous regions integrated into functional neural networks [22],
2. findings from meta-analyses of the studies on social cognition in schizophrenia that strongly support the presence of deficits in all SC domains and at the same time underscore the need to develop broader conceptual models for explaining the observed impairments [21],
3. results from single papers indicating the possibility of dissociation of individual domains of social cognition [14, 23] that do not allow firm conclusions to be drawn regarding the existence of networks of connections between SC domains.

This paper seeks to examine the structure and integration level of individual SC dimensions in schizophrenia patients and unaffected controls.

The following hypotheses were formulated:

1. both the level of social cognitive processes and the level of their integration differ significantly in patients with schizophrenia when compared to healthy control subjects,
2. the level of integration of social cognitive processes translates into overall effectiveness of social cognition which means that a group with lower integration of social cognitive processes will perform worse on measures of single cognitive processes than a group characterized by a higher level of integration.

Method

According to the proposal by Berr and Ochsner [15] defining social cognition as a complex system of different regulatory processes, for the purpose of this study the authors have prepared a battery of tests and test experimental trials. In order to assess theory of mind, i.e. the process of recognition and interpretation of another person's knowledge, intentions and other mental representation, the „Theory of Mind Test Picture Stories" by Martin Brüne [24, 25] was administered. This tool, made available to one of the Authors by Brüne, has been verified for theoretical and clinical validity: it

differentiate healthy individuals from patients with psychotic disorders simultaneously having problems in social functioning. The test content was used as an experimental material in a study with applied functional magnetic resonance imaging, which was attended by patients with schizophrenia and a group of healthy subjects. The results clearly showed that it stimulates, in both healthy subjects and patients with neuropsychiatric disorders, the brain areas identified in other studies as essential for the social cognition functioning (primarily, temporo-parietal junction in left and right hemisphere, precuneus, frontal part of the cingulate gyrus, medial frontal cortex bilaterally, and in general the dominance of hemispheric activation of the right over the left hemisphere) [26]. The original version of test is a set of six picture stories, with each story consisting of four pictures. Illustrations are non-verbal, subjects are asked to arrange chaotically scattered images into a sensible story, by organizing pictures in the correct order (non-verbal aspect). Then questions (in the standardized form) are added to the arranged stories (verbal aspect). Both story completion and verbal response accuracy are qualitatively assessed. Krukow [16] carried out the adaptation and translation of the test (agreed with the author of the original). In the Polish version of „Theory of Mind Picture Stories" (ToMPS) 5 sets of stories are used. In general, the method allows the measurement of the following variables: understanding of 1st-, 2nd- and 3rd-order mental states, understanding of intentions, lie detection, understanding of the reciprocity rule and additionally above-mentioned variables: the indicators of correct spatial arrangement, accuracy of response to supplementary questions and the total points. More information about the tool and its use in clinical settings, including neuropsychological research can be found in the work of Krukow [16, 27] and Krukow and Karakuła [28].

In order to evaluate the process of emotion recognition, the facial expression set has been used from the Ekman and Friesen collection [29]. Six basic emotions are expressed: surprise, anger, joy, sadness, disgust and fear. In order to check the accuracy of stimuli perception, an investigator asks the following question twice: Please tell me, is it the face of a man or a woman? If the patient responses incorrectly twice, or states that (s)he cannot recognize correctly, it is considered that due to sensory limitations the test results cannot be taken into account in the further empirical analysis.

Due to the relatively frequent use of social cognition assessment tools containing facial expression, the set was supplemented by an additional task, in which the person recognizes various mental states (not just the emotions), from the pose expression. Test stimuli of the „Figures" were six drawings of schematic figures showing different poses and gestures, presented in the form of black bars and lines, no shading and background. These drawings were taken from the publication by Argyle [30]. They are drawn in black ink on a white sheet of A4 paper, the figures are 14 cm tall. The following mental states are expressed: request, disgust, arrogance, helplessness, anger, cogitation.

The third element included in the methodological plan was the self-criticism assessment, seen as an indicator of insight. Its evaluation was carried out as follows: after the social cognition testing the subjects were asked to self-measure their own performance. Respondents were asked to evaluate themselves on a five-point scale, ranging from „very poor" to „very good." The purpose of this measurement was to

determine the accuracy level of performance in social cognition tests through the analysis of possible differences between patients with schizophrenia for whom the impairments were assumed and healthy subjects in whom these processes should function properly. This procedure of self-criticism assessment is a standard in neuro-psychological research, applied mainly to patients with disturbed self-awareness due to acquired brain dysfunctions [31, 32].

In the present study, the SPSS statistical package IBM SPSS Statistics 20.0 has been used, and the following methods were applied: Student's t-test to determine statistical differences between the groups, and in cases of variables with non-Gaussian distribution the Mann-Whitney U test, and in addition, the Pearson r and Spearman Rho coefficient to assess the strength and significance of the correlation, also depending on the characteristics of variables distribution.

Material

The total of 55 subjects participated in the study, including:

– 30 subjects (13 F + 17 M) formed a clinical group of patients diagnosed as paranoid schizophrenia according to DSM-IV criteria (SCH),
– 25 subjects (10 M + 15 M) – a control group without mental disorders and neurological history (HLT), matched for age, gender and education to the clinical group.

The average age in the clinical group was 37.30 ± 14.34, while in the control group 43.80 ± 11.06. Although the subjects from the control group were slightly older than those from the clinical group, the difference did not reach statistical significance: $U = -1.83$, $p = 0.072$. Groups did not differ significantly in terms of their level of education ($U = -1.46$, $p = 0.148$). All subjects completed more than primary education (had more than 12 years of education).

With regard to the SCH group, all patients at the time of performing tests remained in symptomatic remission (PANSS total = 59.13, SD = 16.8), taking antipsychotics drugs. The average age of onset of illness was 22.73 years (SD = 6.79), duration of disease 10.91 years (SD = 10.4). 12 patients (40%) were hospitalized once, 14 patients (46.67%) 2-5 times, 2 patients (6.67%) 6-10 times and 2 patients (6.67%) above 10 times over a lifetime. The mean dose of neuroleptic drugs was 550 mg (SD = 353.55) of equivalent chlorpromazine [33-36] (in further stages of the study, the relations between type and dose of antipsychotic drugs and the SC results were not analysed due to lack clear evidences for their existence [37]).

Results

To refer the results to the hypotheses, the significance of differences between groups was analysed and assumed relationships (or their lack) between the variables describing the structure of social cognition in patients and healthy controls were assessed.

Tab. 1 summarizes the results for each parameter of social cognition. In all comparisons, patients with schizophrenia scored lower than healthy individuals. Differences

with the highest level of significance indicate the social cognition summed factor: t = -4.65, p <0.0001 (M = 48.41, SD = 9.52 vs. M = 59.60, SD = 5.92), the sum of points obtained in the ToMPS: t = -3.95, p <0.0001 (M = 37.51, SD = 8.90 vs. M = 45.80, SD = 3.42), verbal responses in the test: t = -5.19, p <0.0001 (M = 13.10, SD = 3.14 vs. M = 17.15, SD = 1.78) and the recognition of 1st- and 2nd-order mental states (both p < 0.0001). These results indicate significant disruption in processes of social cognition in the SCH group. Additionally, it should be noted that this set included variables that differentiate the group only at the level of p < 0.05. These are the picture sequencing in ToMPS and understanding of the reciprocity rule.

Table 1. **Comparison of social cognition parameters in both groups**

Social cognition	SCH		HLT		t / U	p
	M	SD	M	SD		
ToMPS sequencing	24.24	6.68	28.65	2.43	U = - 2.48	0.013
ToMPS verbal answers	13.10	3.14	17.15	1.78	t = - 5.19	0.0001
ToM 1°	2,10	0.85	2.95	0.22	U = - 3.79	0.0001
ToM 2°	2.72	1.03	3.75	0.55	U = - 3.67	0.0001
ToM 3°	0.34	0.75	0.48	0.44	U = - 2.76	0.006
ToMPS deception recognition	4.65	1.42	5.65	0.98	U = - 2.91	0.004
ToMPS reciprocity rule	2.72	0.45	3.00	0.03	U = - 2.54	0.011
ToMPS total points	37.51	8.90	45.80	3.42	t = - 3.95	0.0001
Facial expression recognition	7.63	1.77	9.50	2.13	U = - 3.01	0.003
Pose expression recognition	3.41	1.08	4.55	1.70	U = - 3.07	0.002
Accumulated social cognition points	48.41	9.52	59.60	5.92	t = - 4.65	0.0001

t/U - Student's t / Mann-Whitney U
df = 48

Despite significantly less effective social cognition in the patients with schizophrenia, their self-criticism within the analysed range did not differ from that of the healthy individuals. Tab. 2 contains the results of self-criticism relating to indicators of processes of social cognition. In none of the analysed comparisons there were statistically significant differences, which indicate a lower (and thus more appropriate) self-assessment of performance on social cognition tests in the clinical group. The overall self-criticism factor also did not reach the level of statistical significance between the two groups: t = -0.91, p = 0.366 (M = 21.96, SD = 3.27 vs. 23.05, SD = 4.51). Given that patients within SCH group scored significantly lower in social cognition than those in HLT group, it can be concluded that the patients' self-criticism, and indicator of insight, is inadequate, namely overstated. There is a high probability that patients with schizophrenia do not have full insight into the real level of their social functioning. Table 2 – *next page*.

Table 2. **Self-criticism intergroup comparison**

Self-criticism	SCH		HLT		t / U	p
	M	SD	M	SD		
ToMPS self-criticism	4.06	0.70	4.15	0.81	U = - 0.39	0.697
Faces self-criticism	3.34	0.81	3.70	0.86	U = - 1.52	0.127
Figures self-criticism	3.55	0.86	3.65	0.87	U = - 0.65	0.658
Summed self-criticism	21.96	3.27	23.05	4.51	t = - 0.91	0.366

t/U - Student's t / Mann-Whitney U
df = 48

In the next stage, the analysis was carried out to verify hypothesis on the relationship (or its lack) between the various processes forming the social cognition structure in both groups. In this study, the processes of recognition and understanding of knowledge and intentions (theory of mind) inferred from the narrative picture stories, and recognition of emotions and other mental states from facial expressions and expressive poses were taken under consideration. In numerous publications, those variables are understood as identical / interchangeable with the assumption that they are equal and closely related to each other variants of social cognition [e.g. 38-40]. In the SCH group, these assumptions have not been fully verified. In addition, in this study, the Authors use the neural network model, in which the issue of integration / disintegration of the social cognition structure is as important as the assessment of the effectiveness of individual social cognitive functions. Therefore, correlations between these indicators were calculated.

Tab. 3 shows the results of these calculations in the SCH group. Both the results of the Faces and Figures trials do not correlate significantly with the results of the ToMPS, which assess theory of mind ($r = 0.03$, $p = 0.873$, $R = 0.29$, $p = 0.124$ respectively). The results of Faces task, examining emotion recognition, do not correlate with any of the ToMPS parameters. Thus, in the SCH group theory of mind and emotional expression interpretations are not linked. The results of Figures task correlate significantly only with the spatial arrangement of the ToMPS picture stories and the lie detection. It should be noted, however, that these correlations are weak: $R = 0.039$, $p = 0.036$ and 0.037 respectively.

Table 3. **Social cognition correlates in clinical group**

SCH	ToMPS sequen.	ToMPS verb. answ.	ToMPS ToM 1°	ToMPS ToM 2°	ToMPS ToM 3°	ToMPS Deception recogn.	ToMPS Recipr. rule	ToMPS total points
Faces	0.12	- 0.08	- 0.02	0.01	- 0.13	0.05	0.06	0.03
Figures	0.39*	0.27	0.35	- 0.13	0.18	0.39*	0.31	0.29

* - correlations with statistical significance p < 0,05
** - correlations with statistical significance p < 0,01

Table 4. **Social cognition correlates in control group**

HLT	ToMPS sequen.	ToMPS verb. answ.	ToMPS ToM 1°	ToMPS ToM 2°	ToMPS ToM 3°	ToMPS Deception recogn.	ToMPS Recipr. rule	ToMPS total points
Faces	0.44*	0.47*	0.18	0.37	0.27	0.44*	0.35	0.59**
Figures	0.51*	0.59**	0.20	0.54*	0.50*	0.37	0.35	0.72**

* - correlations with statistical significance p < 0.05
** - correlations with statistical significance p < 0.01

The relationship between the indicators of theory of mind and facial expression recognition in the HLT group (Tab. 4) took different a shape. Both the results of the Faces and the Figures significantly correlated with the sum of points in the ToMP. The correlation between theory of mind and the Faces was moderate (although close to high): R = 0.59, p = 0.006, and the correlation between ToMPS total points and the Figures was high: R = 0.72, p = 0, 0001. Besides, significant moderate correlations were noted between the results of the Faces and: the ToMPS picture arrangement, answers to the ToMPS questions and lie detection. There was also statistical evidence of positive moderate correlations between the Figures and: the ToMPS picture arrangement, verbal responses, recognition of 1st- and 2nd-order states of mind. Overall, it can be said that in the HLT group – essentially different than in the SCH – various types of mentalizing processes are significantly integrated with each other.

Another research area regarding the integrity of social cognition was to evaluate the assumed associations between self-criticism (an indicator: an overall self-criticism factor) and recognition of various mental states, as measured by ToMPS, the Faces and the Figures.

Table 5. **Correlations of self-criticism and social cognition in both groups**

SCH Self-criticism	ToMPS sequen.	ToMPS verb. answ.	ToMPS ToM 1°	ToMPS ToM 2°	ToMPS ToM 3°	ToMPS Deception recogn.	ToMPS Recipr. rule	ToMPS total points	Faces	Figures
	0.21	(r) 0.06	0.17	0.10	0.04	0.01	0.02	(r) 0.30	0.35	- 0.03
HLT Self-criticism	ToMPS sequen.	ToMPS verb. answ.	ToMPS ToM 1°	ToMPS ToM 2°	ToMPS ToM 3°	ToMPS Deception recogn.	ToMPS Recipr. rule	ToMPS total points	Faces	Figures
	0.41*	0.38	0.24	0.34	0.26	0.41*	0.02	0.56*	0.72**	0.71**

* - correlations with statistical significance p < 0.05
** - correlations with statistical significance p < 0.01
 (r) – Pearson r

Tab. 5 shows the results of these analyses in the SCH and HLT groups. In the clinical group, there was no such associations. Total self-criticism did not correlate either with the ToMPS, or with results of the Faces and the Figures. The results obtained in the HLT group were different. A high positive correlation indicates a significant relationship between self-criticism and the recognition of emotion from facial expres-

sions: R = 0.72, p = 0.0001, and with the Figures results: R = 0.71, p = 0.0001. Other results included moderate correlations between self-criticism and: the sum of points in ToMPS: R = 0.56, p = 0.010, and picture arrangement and lie detection in ToMPS: R = 0.41, p = 0.046 – here the result on the borderline of statistical significance. These results suggest that healthy individuals monitor their own social cognition processes and have an appropriate, self-critical attitude towards them. This phenomenon was not observed in the group of patients with schizophrenia. Table 5 *next page*.The final stage of the analysis of the social cognition integrity in the clinical and control group was to evaluate the main parameters of social cognition, i.e. general sums of points from the tests and tasks in relation to the overall level of social cognition. The set of variables included selected demographic and medical factors which potentially may correlate with previously mentioned main dependent variables.

Among separate tasks in the SCH group, an important correlate of the overall social cognition was the ToMPS indicator assessing theory of mind. This correlation was very high (R = 0.92, p = 0.0001). There was also a correlation between the results of the Figure task but only a weak one (R = 0.40). Correlation coefficients allow the conclusion that theory of mind is by far the most dominant parameter for all the processes of social cognition in the SCH group. The two additional variables, namely patients' age and duration of illness, were significantly associated with social cognition, but the former was a stronger correlate than the latter: R = -0.52, p = 0.005; age and overall social cognition: R = -0.40, p = 0.032, which is consistent with the results of other authors [41].

In the HLT group, there were more correlates of the overall social cognition, relationships between all statistically significant parameters was very strong and included: the ToMPS total points: R = 0.87, p = 0.0001, the Faces results: R = 0.82 , p = 0.0001, the Figures: R = 0.81, p = 0.0001 and the self-criticism index: R = 0.60, p = 0.005.

It can be concluded that in patients with schizophrenia the process of theory of mind is the most important factor for the overall level of social cognition. Given that in this group the level of social cognition is significantly lower than in healthy subjects, there is a high probability that a disturbance in the theory of mind operations plays crucial role in the clinical picture of the whole structure of the social cognition disruptions.

Table 6. **Correlations of social cognition accumulated result and individual social cognition parameters**

SCH Accum. social cognition	ToMPS total points	Faces	Figures	Self-criticism	Age	Duration of illness
	(r) 0.92**	0.26	0.40*	(r) 0.30	- 0.40*	- 0.52**
HLT Accum. social cognition	ToMPS total points	Faces	Figures	Self-criticism	Age	Duration of illness
	0.87**	0.82**	0.81**	0.60**	- 0.28	–

* - correlations with statistical significance p < 0.05
** - correlations with statistical significance p < 0.01
 (r) – Pearson r

Taking into account the significant correlations between age and social cognition, and especially social cognition and duration of illness, additional analysis was conducted regarding relations between social cognition and demographic and medical independent variables. The results are shown in Tab. 7.

Table 7. **Correlations between social cognition with age and duration of illness in patients with schizophrenia**

SCH Age	ToMPS sequen.	ToMPS verb. answ.	ToMPS ToM 1°	ToMPS ToM 2°	ToMPS ToM 3°	ToMPS Deception recogn.	ToMPS Recipr. rule	ToMPS total points	Faces	Figures
	- 0.39*	- 0.49**	- 0.49**	- 0.30	- 0.26	- 0.42*	- 0.30	- 0.49**	0.27	- 0.15
SCH Duration of illness	ToMPS sequen.	ToMPS verb. answ.	ToMPS ToM 1°	ToMPS ToM 2°	ToMPS ToM 3°	ToMPS Deception recogn.	ToMPS Recipr. rule	ToMPS total points	Faces	Figures
	- 0.48**	- 0.54**	- 0.52**	- 0.36	- 0.29	0.44*	- 0.40*	- 0.55**	0. 26	- 0.23

* - correlations with statistical significance p < 0.05
** - correlations with statistical significance p < 0.01

Duration of illness correlates significantly and moderately with the ToMPS results, the highest correlation applies to the sum of points obtained in this task: R = -0.55, p = 0.006. Correlations of the other parameters of social cognition measured with ToMPS (spatial arrangement, verbal answers, recognition of the 1st-order state of mind, lie detection and reciprocity rule understanding) take very similar values of the correlation coefficient (from 0.40 to 0.54). For indicators correlating with age in the SCH group, very similar results were obtained (from 0.39 to 0.49). At the same time, there was no significant correlation between age, duration of illness with results of the Faces and Figures tasks, and thus, methods assessing the ability to infer mental states from facial and pose expressions. This result should be related to the correlation coefficients in Tab. 6, they show that theory of mind is a parameter most strongly and almost exclusively associated with the overall level of social cognition. Taking into account the above data regarding the analysis of the duration of illness on the social cognition, one can hypothesize that the reduction in efficacy of theory of mind, occurring with increasing duration of illness, involves the gradual deterioration of social cognition in general.

Discussion

The obtained results confirm the presence of social cognition impairments in schizophrenia. In all assessed parameters, the group of patients with schizophrenia received lower scores than the healthy controls, which is consistent with the conclusions of the available literature [42-44]. Differences with the highest level of statistical significance refer to social cognition in general, verbal response in ToMPS and recognition of 1st, 2nd and 3rd-order mental states, and at a slightly lower level: spatial arrangement of ToMPS stories and the reciprocity rule understanding. The latter refers to recognition of conventional social behaviour, rather than recognition of mental states of social

interaction participants [24]. In a study by Krukow [16] with ToMPS application, this indicator weakly differentiated patients with acquired brain dysfunction and neurologically healthy individuals, which may indicate that it is not sensitive to the specific impairments of social cognition in clinical groups. The analysis of inter-group differences indicate that the verbal answers from ToMPS, more than spatial arrangement of stories itself, highlight the discrepancy of the results obtained by the clinical group. The data would seem to suggest the existence of language dysfunctions connected with theory of mind in this group. It seems that this hypothesis should be verified in future research. Patients with schizophrenia also presented inadequate, inflated self-criticism regarding the efficacy of their social cognition processes. The self-monitoring for the correct identification and interpretation of other people's mental states is disrupted in schizophrenia. In addition, patients' self-criticism does not correlate significantly with the variables of social cognition, which may indicate disintegration of the interconnections between self-criticism and cognitive processes. The answer to the question of whether this disintegration also occurs at the level of neuronal networks requires further studies, including those which will employ functional neuroimaging and / or neurophysiological methods. Relationships of this type are present in healthy subjects, the correlation coefficients which are their indicators are high and reach a high level of statistical significance. Thus, disintegration of self-criticism and social cognition in schizophrenia may be regarded as a pathological condition. Similar findings as regards the patients' lack of self-assessment accuracy in the aspect of neurocognitive functions (except for executive functions) achieved Poletti et al [45], which may suggest that the process of disintegration between objective assessment and self-assessment affects a number of cognitive processes in schizophrenia.

In the SCH group the disintegration applies to recognition of mental states, mainly interpretation of emotional expression and theory of mind. Remarkably, there were no correlations at level of statistical significance $p < 0.01$ between the mentioned variables. This result is particularly important also from the methodological point of view. It suggests that it is inappropriate to treat indicators of emotion recognition on the basis of facial or pose expression and theory of mind as interchangeable, equivalent indicators of social cognition in schizophrenia [e.g. 39, 40]. On the contrary, further analyses lead to the conclusion that these dimensions of social cognition present different dynamics of change with regard to duration of illness. They also play a very different part in explaining the potential role of individual mentalizing factors in general social cognition. It should be noted that in the HLT group significant associations between the analysed variables were reported. In this group, deep integration of different dimensions of social cognition occurs, and correlations combine all the analysed types of social cognition indicators.

The analysis of participation of various parameters of social cognition in the accumulated result also shows a fundamentally different structure in the patients with schizophrenia and the healthy controls. In the latter all indicators correlated significantly with the accumulated social cognition indicator, what is more, these correlations are high and very high. This allows us to describe the structure of social cognition in the HLT group, as highly integrated, coherent, in which various social cognitive processes,

including self-criticism, make a relatively similar contribution in ensuring the efficacy of social cognition in general. In the clinical group, this structure is clearly dominated by the function of theory of mind. At the same time, processes of emotion recognition are not associated with the accumulated indicator of social cognition.

Unlike in the HLT group, the age correlates with social cognition in such a way that the older the patients with schizophrenia became, the lower their social cognition efficacy is. Duration of illness is an even stronger correlate; its progress impairs social cognition. This finding is consistent with the meta-analysis by Savla et al [21] regarding research on social cognition in schizophrenia, involving, among others, the dynamic change.

To summarize, our findings suggest that the structure of social cognition in schizophrenia, unlike in healthy subjects, has the characteristics of general disintegration, which is part of the current understanding of the phenomena observed in schizophrenia in terms of neuronal network dysfunction – as the process of disconnection [9, 46].

Conclusions

1. Individual social cognitive functions are weaker in patients with schizophrenia compared with healthy control subjects, which result in lower overall efficacy of social cognition in the clinical group.
2. The structure of social cognitive processes in schizophrenic group, unlike in healthy subjects, shows characteristics of generalized disintegration.
3. In the clinical group, theory of mind is the most important factor for the general level of social cognition.
4. There is inadequate, inflated self-esteem of patients regarding the efficacy of social cognition.
5. Self-criticism in the SCH group does not correlate significantly with the other social cognition variables, which may indicate the presence of the disintegration of the interconnections between self-criticism and cognitive processes.
6. There are no grounds for treating indicators of emotion recognition based on facial expressions and theory of mind interpretation as equivalent indicators of social cognition in schizophrenia.

Дезинтеграция процессов общественного познания при шизофрении

Содержание

Вступление. Несмотря на бурливое развитие исследований над нарушениями познания общественного порядка при шизофрении и далее продолжаются изыскания более широких концептуальных моделей, в том числе учитывающие сетевые теории, объясняющие наблюдаемые расстройства.

Задание. Заданием настоящей работы была оценка структуры процессов общественного познания при шизофрении на фоне сравнительной группы здоровых людей.

Материал. Исследованная группа состояла из 55 лиц: 30 больных шизофренией параноидальной по Классификации ДСМ-IV в периоде ремиссии и 25 здоровых людей контрольной группы, подобранной с точки зрения возраста, пола и образования клинической группы.

Методы. Для оценки процессов общественного познания использована батерия тестов составленной из Theory of Mind Picture Stories Test служащей для исследования Теории ума, пробы „Лица”, из состава мимических экспрессии из собрания Экмана и Фрейсена и

„Фигуры” из работы Агриля – для оценки распознавания эмоций соответственно на основе мимической экспрессии и экспрессии позы. Кроме того, оценен самокритицизм по отношению к исследованным изученных функций общественного познания.

Выводы. Уровень отдельных процессов общественного познания был низший в группе пациентов, больных параноидальной шизофренией в сравнение с контрольной группой, что перекладывалось на низшую общую эффективность общественного познания в этой группе. Структура процессов общественного познания при шизофрении различается от здоровых людей, которая обладала чертами общей дезинтеграции. В группе больных шизофренией процесс теории ума был найболее важным фактором для общего уровня общественного познания. Отмечена неадекватная самооценка относительно эффективности собственных процессов общественного познания среди больных шизофренией. Самокритицизм пациентов не коррелировал существенным образом с изменчивыми из области общественного познания. Суммируя, необходимо отметить, что группа в которой отмечен низкий уровень интеграции общественного познания и одновременно эта группа проявляла низшие результаты в радиусе отдельных измерений общественного познания.

Ключевые слова: шизофрения, общественное познание, дезинтеграция, теории неврональных сетей, теория ума

Desintegration der kognitiven Prozesse in Schizophrenie

Zusammenfassung

Einleitung. Trotz der schnellen Entwicklung der Forschungen an den Störungen der sozialen Kognition in der Schizophrenie, dauert immer noch die Suche nach den breiteren konzeptuellen Modellen, darunter solcher, die die Netztheorien berücksichtigen, welche die nachgewiesenen Störungen erklären. Das Ziel unserer Arbeit war die Bewertung der Struktur der Prozesse der sozialen Kognition in der Schizophrenie im Vergleich mit der Kontrollgruppe der psychisch gesunden Personen.

Material. An die Studie wurden 55 Personen eingeschlossen: 30 Patienten mit der diagnostizierten paranoiden Schizophrenie nach DSM-IV in der Zeit der Remission und 25 Personen aus der Kontrollgruppe, die nach dem Alter, Geschlecht, Ausbildung aufgeteilt wurde.

Methoden. Zur Bewertung der Prozesse der sozialen Kognition wurde die Testbatterie aus „Theory of Mind Picture Test" verwendet, die zur Untersuchung der Theory of Mind dient, die Proben „Gesichter" aus der Kategorie der mimischen Expressionen von Ekman und Friesen und „Figuren" aus der Veröffentlichung von Argyle – zur Bewertung der Erkennung von Emotionen entsprechend nach der Expression des Gesichts und Expression der Geste, und zusätzlich die Bewertung von Selbstkritik im Bezug auf die untersuchten Funktionen der sozialen Kognition.

Schlussfolgerungen. Der Level der einzelnen Prozesse der sozialen Kognition war niedriger in der Gruppe der Patienten, die an Schizophrenie krank sind, im Vergleich mit der Kontrollgruppe, was sich in der niedrigeren allgemeinen Effektivität der sozialen Kognition in dieser Gruppe zeigte. Die Struktur der Prozesse der sozialen Kognition in der Schizophrenie, anders als bei den gesunden Personen, zeigte die Eigenschaften einer allgemeinen Desintegration. In der Gruppe der Schizophrenie Kranken war der Prozess der Theory of Mind der wichtigste Faktor für den allgemeinen Level der sozialen Kognition. Man bewies eine nicht adäquate, erhöhte Selbsteinschätzung im Hinblick auf die Effektivität der eigenen Prozesse der sozialen Kognition in der Gruppe der Patienten mit der Schizophrenie. Die Selbstkritik der Patienten korrelierte nicht signifikant mit den Variablen aus der sozialen Kognition. Zusammenfassend soll man feststellen, dass die Gruppe, in der der niedrige Level der Integration der Prozesse der sozialen Kognition nachgewiesen wurde, erzielte gleichzeitig niedrigere Ergebnisse im Bezug auf die einzelnen Dimensionen der sozialen Kognition.

Schlüsselwörter: Schizophrenie, soziale Kognition, Desintegration, Theorie der neuronalen Netze

La désintégration des processus de la cognition sociale dans la schizophrénie

Résumé

Introduction. Malgré le développement rapide des recherches concernant les troubles de la cognition sociale dans la schizophrénie on cherche toujours des nouveaux modèles théoriques, incluant

les conceptions du réseau neuronal, pour expliquer ces troubles en question. Ce travail vise à évaluer la structure des processus de la cognition sociale des personnes schizophrènes en comparaison avec le groupe de contrôle de personnes saines.

Matériel. On examine le groupe de 30 patients avec le diagnostic – schizophrénie paranoïde (d'après DSM-IV), durant la rémission et le groupe de 25 personnes saines (groupe de contrôle bien choisi du point de vue de l'âge, sexe, éducation).

Méthodes. Pour analyser les processus de la cognition sociale on use la batterie des testes : Theory of Mind Picture Stories, « Faces »

d'Ekman et Friesen (pour l'expression mimique), « Figures » d'Argyle (pour la recognition des émotions à la base de l'expression mimique et de gestes et pour évaluer l'autocritique).

Conclusions. Le niveau des processus particuliers de la cognition sociale est moins élevé dans le groupe de patients que dans le groupe de contrôle. Dans la schizophrénie la structure de ces processus est en général désintégrée. Dans le groupe de patients la théorie de l'esprit est un facteur le plus important pour le niveau général de la cognition sociale. On y observe encore le niveau plus élevé de l'autoestimation des patients quant à l'effectivité des leurs processus cognitifs. L'autocritique des patients ne corrèle pas avec

d'autres variables de la cognition sociale. En somme il faut dire que le niveau bas de l'intégration des processus de la cognition sociale corrèle avec les résultats peu élevés des dimensions particulières de cette cognition.

Mots clés : schizophrénie, cognition sociale, désintégration, conception du réseau neuronal, théorie de l'esprit

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