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The differences in intellectual functioning between patients with schizophrenia and their healthy siblings

Investigations of intellectual abilities in patients with schizophrenia have provided valuable information regarding the cognitive deficits associated with schizophrenia, which since the times of Kraepelin were considered to be the inseparable display element of clinical in this disease (9). Although thenceforward elapsed much time and spacious investigative material has been collected, data concerning the course of the schizophrenia in the aspect of intellectual functioning are still inadequate.

Weickert and Goldberg (11), invoking their own research and given from the literature, give three possible manners of manifesting cognitive disturbances among the ill with the schizophrenia. Firstly the disease process manifests itself as cognitive impairment that may be relatively profound and widespread at an early stage of development and is present subsequent to the onset of the psychotic symptoms. This is the group of patients with already lowered level of intellectual functioning before the disease. The second course suggests that the cognitive deficits appear in the moment of falling ill, and the profile of presented deficits that refer to executive functions, attention and the long-term memory, is more limited. Among them, however, the decline of the general intelligence appears, though it does not come to developing a full-blown dementia. Other possibility is also the appearance of only subtle cognitive disturbances concerning executive functions, working memory and attention in the moment of symptom onset. It is the group with preserved level of the general intelligence which, however, also represents certain permanent cognitive disturbances (1).

Basic deficits in the schizophrenia are disturbances of working memory (the ability of remembering of some information for a short period and manipulating it) and executive functions. It may lead to distortion in planning processes, undertakings of the decision, solving problems, and so-called mental flexibility which makes possible the adaptation to changing circumstances (3). Besides, people with diagnosis of the schizophrenia are characterized by the following disturbances of attention: the intensive susceptibility on distracters, difficulties in holding up the attention for a long time, disturbances of attention selectiveness, and the slowdown of sensory data processing (5).They also display disturbances of the phonological and category fluence, disturbances of the understanding of the composite context of statement and the weakness of the verbal learning, as well as spatial and motor process disturbances, the decreasing of the visual-spatial co-ordination, the impairment of the memory and the spatial attention (3).

Interest in assessment of intelligence was in part stimulated by the observations that there were significant differences in performance when patients with schizophrenia were compared to normal controls and other psychiatric populations (3, 9).

In the current research of the endophenotypical marker in the schizophrenia there are researches into disturbances of the cognitive function, and especially those connected with working memory, attention (9). Because intelligence tests like Wechsler Adult Intelligence Scale assess multiple cognitive domains, they can be used also to investigate the cognitive abilities of

patients with schizophrenia. That is why the criterion IV verification for endophenotype according to Gottesman and Gould seemed to be interesting concerning differences among patients and their healthy siblings in the range of intellectual functioning (7).

The aim of the work was the comparison of the level of intellectual functioning of patients with the diagnosis of the schizophrenia and their healthy siblings and the research of relationships among the variables connected with the disease and the examined cognitive functions by means of WAIS-R.

MATERIAL AND METHODS

The group investigated were patients with the diagnosis of the paranoid schizophrenia in the phase of the remission (n = 44) according to ICD-10, and their healthy siblings (n = 47). The state of the mental status of siblings was rated with the MINI scale. The methods applied were the following: 1. Socio-demographic Questionnaire constructed by the authors, containing personal data and data connected with the disease. 2. WAIS-R (Wechsler Adult Intelligence Scale – Revised) (4). That test measures the level of the general intelligence and consists of the word scale (6 subtests) and executive (5 subtests). After the calculation of results we obtain 3 indicators of intellectual functioning of the individual: the general intelligence quotient, the word intelligence quotient and the executive intelligence quotient, as well as results counted for each subtest. 3. Mini-International Neuropsychiatric Interview – M.I.N.I. PLUS (10) for evaluation of mental status of siblings and controls.

Statistical analysis. Because of the fact that WAIS-R variables are normally distributed (the Kolmogorov-Smirnov test, p-value>0.1) t-Student test was applied to test the hypotheses that the population means are equal.

RESULTS

Table 1. Socio-demographic data of the investigated group

	Patients N=44		Siblings N=47		Total N=91	
Sex	N	%	N	%	N	%
Female	15	34.1	24	51.1	39	42.4
Male	29	65.9	23	48.9	52	57.1
	X	SD	X	SD	X	SD
Age (years)	26.73	5.67	26.87	6.83	26.80	6.26
Education (years)	14.71	2.72	14.94	2.92	14.83	2.82
Disease outset (years)	21.03	4.21				
Disease duration (years)	6.52	5.08				
Duration of untreated psychosis (months)	9.60	12.46				

The data obtained for the investigated group were introduced in Table 1. The differences among the group of patients and their healthy siblings in the range of age and the level of education appeared to be statistically insignificant, which provided us with the possibility of comparison of both groups with reference to the level of intelligence.

In Table 2 statistically significant differences among the investigated groups were placed according to following WAIS-R subscales. As it appears from Table 2. patients as compared with their healthy siblings despite the comparable level of education and age are characterized by a the considerably lower general intelligence full-scale IQ ($p<0.004$), and performance IQ ($p<0.001$). In the range of subscales, these differences are statistically significant with reference to: Picture Arrangement ($p<0.05$) that reflects logical/sequential reasoning, social insight; Block Design ($p<0.002$) – Spatial perception: visual abstract processing & the problem solving; Object

Assembly ($p<0.05$) –visual analysis, synthesis, and construction; Digit Symbol ($p<0.001$) – Visual-motor coordination, motor and mental speed; Performance Scale ($p<0.001$) – visual discrimination and analysis; Arithmetic ($p<0.04$) – measures mental concentration and computational skill. The decrease of intellectual functions refers mostly to three areas of cognitive functions: perceptual organization (Block Design, Picture Arrangement, and Object Assembly), processing speed (Digit Symbol), Working memory (Arithmetic).

Table 2. Average values obtained in WAIS-R subtests

	Group	Mean	SD	t-test for Equality of Means	
				t	Sig. (2-tailed)
Wechsler Picture Arrangement	patients	9.081	2.179	-1.997	0.050
	siblings	10.333	3.021		
Wechsler Block Design	patients	10.209	2.026	-3.249	0.002
	siblings	12.033	2.470		
Wechsler Object Assembly	patients	10.058	2.740	-1.997	0.050
	siblings	11.333	2.339		
Wechsler Arithmetic	patients	8.029	2.528	-2.128	0.040
	siblings	9.667	2.462		
Wechsler Digit Symbol	patients	8.794	2.972	-3.903	0.001
	siblings	11.600	2.749		
Wechsler Performance Scale	patients	48.470	7.628	-3.893	0.001
	siblings	56.600	9.076		
Wechsler Total Scale	patients	100.64	16.622	-2.999	0.004
	siblings	113.23	16.900		
IQ Performance Scale	patients	92.823	10.364	-3.690	0.001
	siblings	103.43	12.629		
IQ Total Scale	patients	91.941	10.171	-3.033	0.004
	siblings	99.866	10.718		

In the following stage work we searched for the relationships between the level of intellectual functioning and the disease duration, duration of untreated psychosis, the age of falling ill with schizophrenia. In Table 3 only statistically significant relationships among investigated variables were introduced. Of three variables, only the duration of psychosis had the influence on cognitive disturbances measured in subtests: Wechsler Information – degree of general information acquired from culture; Wechsler Picture Arrangement – logical/sequential reasoning, social insight; Wechsler Block Design –Spatial perception: visual abstract processing & problem solving.

Table 3. Relations among the disease duration and WAIS-R results

WAIS-R		Disease duration
Wechsler Information	Pearson Correlation	0.295
	Sig. (1-tailed)	0.050
Wechsler Picture Arrangement	Pearson Correlation	-0.308
	Sig. (1-tailed)	0.041
Wechsler Block Design	Pearson Correlation	-0.351
	Sig. (1-tailed)	0.023

DISCUSSION

Disturbances of intellectual functioning determine the separate dimension of characteristic symptoms of schizophrenia (2). Results of the present research show that cognitive deficits are already present in the prodromal phase, and the intelligence quotient among the ill with schizophrenia can undergo distinct decrease in the period of two years before appearance of the first episode (3). The majority of the investigators confirm also a relative stability of presented deficits in the course of disease (8).

The results obtained in the presented investigation confirm reports pointing out that people with schizophrenia reveal a significantly lower level of intellectual functioning than healthy people (3, 6). We ascertained that diseased persons function indeed worse in the range the of reasoning on visual material. Besides, we ascertained among them deficits in the range of the working memory and attention, and especially the abilities of concentrating on an exercise and accomplishing it in a relatively short time. Weikert and Goldberg (11) in their own research showed that results in Symbols of Numbers and the Arithmetic subtests surrender to significant decrease as these which to the greatest degree engage working memory damaged in schizophrenia. Moreover, in the presented investigation we showed that people with schizophrenia present, comparatively to their healthy siblings, the significantly lower level of the performance and general intelligence. Obtained results are consistent with data from the literature (3). The differences in intellectual abilities refer mostly to the following areas of cognitive functions: perceptual organization, processing speed, working memory. These three cognitive domains fulfil the criterion IV for endophenotype according to Gottesman and Gould (7). Deepening of the knowledge about intellectual functioning of people with schizophrenia seems to be extremely essential for practical implications, e.g. creating effective programmes of rehabilitation and early detection of the first symptoms of disorders before appearing full clinical manifestation of psychosis.

The authors of the research fully acknowledged limitations of the research (a small number of groups, the lack of the control group) and they do not claim that the results can be generalized for all the diseased persons and their siblings, they may, however, become a starting point for further research on the deficits of intellectual functioning in schizophrenia.

CONCLUSIONS

1. Patients with schizophrenia represent significantly lower level of intellectual functioning than their healthy siblings in the range of the performance and general intelligence.

2. The differences in intellectual abilities referring mostly to the three areas of cognitive functions: perceptual organization, processing speed, working memory.

3. The age of the person falling ill and the duration of untreated psychosis remain without the influence on the intellectual functioning of patients with schizophrenia.

4. The psychosis duration has an influence on disturbances of cognition measured in the fields of.

5. Verbal comprehension (subtest: information), perceptual organization (subtest: block design, picture arrangement).

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SUMMARY

Investigations of intellectual abilities in patients with schizophrenia have provided valuable information regarding the cognitive deficits associated with schizophrenia. Because intelligence tests like Wechsler Adult Intelligence Scale assess multiple cognitive domains, they can be used also to investigate the cognitive abilities of patients with schizophrenia. The aim of our study was criterion IV verification for endophenotype according to Gottesman and Gould by comparing the level of intellectual functioning of patients with schizophrenia and their healthy siblings and the research on relationships among the variables connected with the disease and the examined cognitive functions by means of WAIS-R The group investigated were 44 patients with the diagnosis of the paranoid schizophrenia in the phase of the remission (ICD-10), and their 47 healthy siblings. The following methods were applied: 1. Socio-demographic Questionnaire constructed by the authors, containing personal data and data connected with the disease. 2. Wechsler Adult Intelligence Scale – Revised 3. MINI Plus. Patients with schizophrenia represent significantly lower level of intellectual functioning than their healthy siblings in the range of the performance and general intelligence. The differences in intellectual abilities refer mostly to the three areas of cognitive functions: perceptual organization, processing speed, working memory. The age of the person falling ill and the duration of untreated psychosis remain without the influence on the intellectual functioning of patients with schizophrenia. The psychosis duration has an influence on disturbances of cognition measured in the fields of verbal comprehension (subtest: information), perceptual organization (subtest: block design, picture arrangement).

Różnice w funkcjonowaniu intelektualnym pomiędzy grupą pacjentów z rozpoznaniem schizofrenii i ich zdrowym rodzeństwem

Badania dotyczące funkcjonowania intelektualnego pacjentów ze schizofrenią dostarczają wartościowych informacji związanych z deficytami poznawczymi w tej chorobie. Ponieważ testy mierzące poziom inteligencji np. skala WAIS-R oszacowują różnorodne dziedziny poznawcze, mogą być użyteczne w badaniach zaburzeń funkcji poznawczych w schizofrenii. Celem naszej pracy była weryfikacja kryterium IV dla endofenotypu wg Gottesmana i Goulda poprzez porównanie poziomu funkcjonowania intelektualnego osób z rozpoznaniem schizofrenii i ich zdrowego rodzeństwa oraz poszukiwanie związków pomiędzy zmiennymi związanymi z chorobą a badanymi przy pomocy WAIS-R funkcjami kognitywnymi. Grupę badaną stanowiło 44 pacjentów z rozpoznaniem schizofrenii paranoidalnej w fazie remisji według ICD-10 oraz 47 osób będących ich zdrowym rodzeństwem. Metoda: 1.Kwestionariusz Socjodemograficzny skonstruowany przez autorów, zawierający dane personalne oraz dane związane z chorobą. 2. WAIS-R (*Wechsler Adult Intelligence Scale – Revised*) 3. MINI Plus. Wnioski:1. Pacjenci ze schizofrenią prezentują znacząco niższy poziom funkcjonowania intelektualnego niż ich zdrowe rodzeństwo w zakresie Skali Bezsłownej i Ogólnej IQ. 2. Różnice w funkcjonowaniu intelektualnym dotyczą głównie trzech obszarów funkcji poznawczych: organizacji postrzegania, szybkości procesów uczenia się, pamięci roboczej. 3. Wiek zachorowania i długość trwania nieleczonej psychozy pozostają bez wpływu na funkcjonowanie intelektualne pacjentów ze schizofrenią. 4. Długość trwania psychozy ma wpływ na zaburzenia kognicji w odniesieniu do rozumowania na materiale słownym (podskala: Wiadomości) i organizacji postrzegania (podskale: Klocki, Porządkowanie Obrazków).