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Research Article

Basic Learning Functions among Young Adults Suffering from Schizophrenia

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Abstract

Background: The purpose of the research was to examine specific learning functions among people suffering schizophrenia and the relationship between the different aspects of intellectual disability and the severity of the mental illness. We hypothesized that (a) a lower level of basic learning functions among people with schizophrenia compared with the general population; (b) wide variance in the degree of damage to the respective functions; and (c) a correlation between the severity of the illness and the degree of intra-individual variance in learning functions.

Methods: The sample consisted of 38 people (35 men and 3 women) suffering schizophrenia, ages 20 to 37 (average 28.6 years), hospitalized in two psychiatric hospitals. The attending physicians in different hospital departments made the formal diagnoses of schizophrenia. The learning functions were examined using MATAL, a computerized set of standardized tests and questionnaires developed for the diagnosis higher education applicants and students who request accommodations on exams and assistance with studies due to learning disabilities.

Results: The learning functions of the participants were lower than the norm of the general population, most significantly in tasks of rapid naming objects, writing efficiency, automatic arithmetic actions (criteria of accuracy and time), delayed recall (recognition), and parallel visual perception. However, no correlation was found between these functions and the severity of the illness.

Conclusion: The precise and correct treatment of learning disabilities might indirectly improve the quality of life of those suffering from schizophrenia.

Keywords: Schizophrenia; Learning functions; Neuropsychological functioning; Positive symptoms; Negative symptoms; Intellectual disability

Introduction

Schizophrenia is one of the most serious mental illnesses. Characterized by disability in the cognitive, perceptual, and emotional realms, it is a chronic syndrome that impairs development and functioning. Research in the field has consistently indicated a general intellectual impairment among people with schizophrenia although most of the research has dealt with general cognitive deficiency in schizophrenia; some have discussed specific cognitive disorders. Research comparing the neurocognitive functions among adolescents with schizophrenia with those of their peers has indicated a significant difference between the groups, in favor of the healthy participants, in those functions related to working memory, concentration, and administrative functions [1]. As early as 1911, Bleuler [2] reported attention disorder among people with schizophrenia; however, despite the numerous reports on this subject, there is a wide disparity between the theory and the empirical findings, perhaps because of the many factors involved [3]. General cognitive disability and functional impairment are commonly found among people with schizophrenia. However, there is little published research on the learning functions of schizophrenia patients. "Learning functions" refers to basic learning abilities, which project on general academic functioning, including reading, writing, arithmetic, verbal memory, and visual perception. Knowledge about learning functions among schizophrenia patients, as well as the relationship between these functions and cognitive disabilities is important, because it may enable the mapping of the academic competence of patients and the planning of appropriate intervention. It has been shown that the treatment of cognitive abilities can potentially change the functional ability of patients [4]. In addition, research on this subject might be able to draw upon information available in the education system to investigate the development of cognitive deficits during the period prior to a first episode of schizophrenia. Recently, researchers used such information to examine differences in former school grades and teacher ranking of students at age 13-14 among people hospitalized as adults for schizophrenia or affective disorders. Comparison of the eighth-grade report cards of the patients with those of their classmates indicated that students who were later hospitalized had significantly poorer nonacademic (behavioral) performance relative to their classmates. The results indicated that performance in nonacademic realms and lower behavior scores by teachers correlated significantly with an early age at the first episode of schizophrenia [5]. Although this study demonstrated the potential of using data from the education system to better understand the development of cognitive deficits in schizophrenia, there is almost no information to date on the character and level of impairment in learning functions among

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people with schizophrenia. The purpose of the present research was to help fill this lacuna in the literature. Based on the theoretical considerations and preliminary findings reviewed earlier, we hypothesized: (1) the basic learning function scores of schizophrenia patients after the first episode of the disease would be lower than the norms in the general population; (2) the degree of disability in the different functions would vary; in other words, for a single individual, some function scores would be lower than others; (3) the severity of the disease would be related to the degree of scattering, or variance, among the different learning functions. This hypothesis was based on research that found a significant correlation between high variance in intellectual functioning and the risk of suffering schizophrenia [6].

Method

Research participants

The study sample was comprised of 38 patients with schizophrenia who were hospitalized in two psychiatric hospitals in northern Israel. The criteria for inclusion in the research were (a) a diagnosis of schizophrenia according to DSM IV [7]; and (b) absence of mental retardation (IQ > 70) or a history of sensory (visual or hearing) impairment or any other chronic medical disability that may have an effect on cognitive functioning. As part of their regular work, the attending physicians in the different departments of the hospital conducted formal diagnoses of schizophrenia with the research participants, based on all the medical information available to them. All the participants signed an informed consent form that was approved by the Helsinki Committee.

The final sample included 35 men and 3 women, with a mean age of 28.6 years. Thirty-five of the participants were born in Israel and 3 were born in other countries (Ethiopia, Russia, and the United States). They all spoke Hebrew as their mother tongue. The mean age of first stay in a psychiatric hospital was 24.4 years (minimum 17; maximum 31). The mean number of times hospitalized was 7.2 times (minimum once; maximum 17 times). The mean total duration of hospitalization was 407.4 days (minimum 17; maximum 1416).

Procedure and measures

The attending physicians in the hospitals evaluated the presence and severity of positive and negative symptoms using the Positive and Negative Syndrome of Schizophrenia Scale (PANSS). This research instrument includes 30 items, grouped into three scales: positive symptoms, negative symptoms, and general symptoms. Every item examines the presence of a symptom and is scored on a seven-point scale (from 1 to 7). The developers of the instrument reported internal consistency of $\alpha = .73$ for the positive scale, $\alpha = .83$ for the negative scale, and $\alpha = .79$ for the general scale ($p < .001$). The information on drug treatment (type and dosage) was collected from the medical files of the participants.

Current cognitive functioning was examined by means of MATAL, a system for diagnosing learning disabilities in adults. MATAL is a computerized system of standardized tests and questionnaires developed in Israel for diagnosis of prospective and current students of higher education who request special conditions on exams and help with studies due to learning disabilities. Israel's National Institute for Testing and Evaluation developed MATAL with the assistance of experts in learning disabilities [8]. The system was designed to diagnosis common learning disabilities: dyslexia, dyscalculia, and dysgraphia, as well as attention disorder. The original diagnostic system consists of two questionnaires and 20 computerized exams that test cognitive functions in different areas: language (reading and writing), quantitative functions, attention, memory, visual perception, and general speed of processing. The effectiveness of the instruments for the purpose of diagnosing learning disabilities was examined in comprehensive validation research conducted at ten institutions of higher education and encompassing about 200 participants. The research tested the quality of the examinations, the process of administering them, and validation of the different performance measures of the tests with clinical populations. Later, national norms of performance were calculated for each diagnostic instrument with a representative sample of the population of candidates and students in institutions of higher education. The sample for the norms was comprised of 508 native Hebrew speakers without learning disabilities, enrolled in bachelor's degree studies at universities and colleges. In other words, there are Israeli norms for each of the tasks examined, which can be compared with the functioning of any individual tested with the system.

In the present research, we selected eight of the tasks from the entire system in order to represent the different areas of the MATAL system, and to examine the primary basic functions in the areas of language, arithmetic, memory, and perception. The tasks included: decoding text, dictation, rapid naming, verbal fluency, automation of arithmetic, immediate recall, delayed recall, and parallel visual perception.

The tasks selected from the MATAL system for use in this research are presented in Table 1.

In order to reduce the data load, we grouped the learning functions into six broad categories that are commonly used in the field of learning functions: (a) Speed of retrieval; (b) Reading; (c) Writing; (d) Arithmetic; (e) Verbal memory; and (f) Visual perception (Table 1).

After obtaining permission from the IRBs of the two medical

Table 1: MATAL Tasks Examined in the Research.

Task	Function examined	Description of task
Decoding text	Fluency and accuracy of reading	Reading a text in Hebrew (vocalized) out loud.
Dictation	Spelling, quality of writing, rate of writing	Writing a text that is read out loud
Rapid naming	Lexical retrieval	Rapid naming of objects, letters, and digits (RAN test)
Arithmetic automation	Arithmetic automation	Judging the correctness of simple equations
Memory and perception	Verbal auditory memory, verbal learning (attention)	Remembering a list of words –recall
Immediate memory	Verbal auditory memory, verbal learning (attention)	Remembers a list of words – recall

centers in which the research was conducted, and Israel's ministry of health, we asked the relevant doctors for assistance in reaching the research sample. The attending physicians presented the purpose of the research to potential participants, and asked those who agreed to sign a statement of informed consent. A researcher then met with the participants, conducted personal interviews, and administered the MATAL diagnostic test to all the participants. It is important to note that the diagnostic tasks were assigned at a rate appropriate to the research participants, with rest breaks. When the need arose, the tasks were divided into two sessions. It should also be noted that participants who decided to drop out during the research did so without any objection (in actual fact, one participants did so).

Data analysis

In the first stage, we examined the correlation between the learning functions and the participants' socio-demographic background and basic clinical variables by means of Pearson correlations. We then compared the functioning of the members of the research population in the MATAL with that of the general population. In order to test the significance of the deviations from the norms, we performed a one-sample t-test. After that, we calculated the intra-individual variance for each participant in the learning function tasks and conducted Pearson correlation tests of this internal variation with the severity of the illness.

Results

First, we examined the relationship between learning functions and basic socio-demographic and clinical variables, such as chronological age, age of first episode of the illness, and number of times hospitalized, in order to rule out the possible intervention of these variables. The findings regarding the relationships are presented in Table 2.

Most of the correlations of learning functions with age, age at first episode of the illness, and times hospitalized were in the lower to moderate range, and not statistically significant. The only exceptions were the correlation of age at first episode of the illness and times hospitalized with the retrieval rate tasks, and a significant negative correlation between times hospitalized and writing tasks.

In Figure 1 we show the deviation of the research participants' scores from the anticipated norms in each of the learning functions, based on the MATAL developmental research. The comparison is presented in terms of standard scores, which represent the functioning of the research group compared with the overall norm. In the field of

Table 2: Pearson Correlation Coefficients (r) Between Learning Functions and Socio-demographic and Clinical Background Variables.

Learning function area	Age (n = 38)[1]	Age at onset (first hospitalization) (n = 27)	Times hospitalized (n = 33)
Retrieval rate	.22	.46*	.41**
Reading	.20	.20	.23
Writing	.13	.27	.36*
Arithmetic	.12	.31	.10
Verbal memory	.05	.10	.16
Visual perception	.03	.00	.18

* p < .05, ** p < .01

[1]In the tests of reading and visual perception, n = 37.

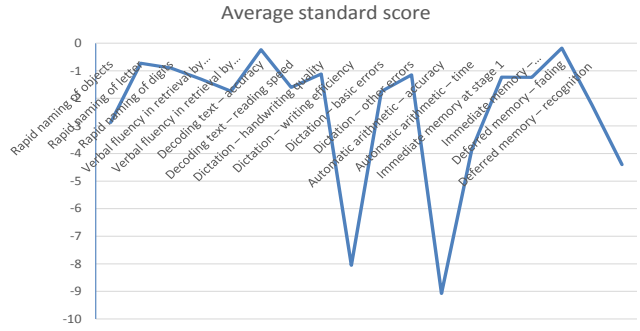

Figure 1: deviation of the research participants' scores from the anticipated norms in each of the learning functions, based on the MATAL developmental research.

learning function diagnosis, it is generally accepted that a standard score of –1 or lower indicates poor functioning and standard score of –2 or lower indicates a very low level of functioning. It is important to note that the Israeli education system differentiates between the cutoff point for providing treatment and the cutoff point for granting accommodations in testing method. Therefore, the presentation of the findings refers to two levels of functions: one, a low level of functioning (standard score of –1 to –1.99), and the other, a very low level of functioning (standard score of –2 and lower). Such reference to a standard deviation from the average and so forth is common in intelligence tests for adults, such as WAIS-R [9].

In the figure we show the functioning of the research participants on the MATAL tasks, compared with the general population.

The participants in the general research group demonstrated especially low functioning compared with the norm in rapid naming of objects, writing efficiency, arithmetic automation (measures of precision and time), delayed recall (recognition), and parallel visual perception. Their functioning was low, compared with the norm, in verbal fluency (retrieval by first letter, retrieval by category), decoding text, reading speed, handwriting quality, spelling mistakes (fundamental and others), and immediate verbal memory. In order to examine the significance of these deviations, we conducted a one-sample t-test. The findings are presented in Table 3.

We found significant deviation from the norm in all the learning functions, with the exception of precision in decoding text, spelling mistakes, and delayed active memory.

In summary, the first two hypotheses were confirmed: the basic learning functions of people who suffered schizophrenia were found to be lower than those of the comparison group (the general population), and some of the functions were significantly lower than the norm of the general population.

We tested the third hypothesis, regarding the relationship between the severity of the illness and intra-individual variance among learning functions, in two stages. In the first stage, we calculated the intra-individual variance of each participant in the nine learning function tasks. In the second stage, we examined the relationship, by means of Pearson tests, between this internal variance and the severity of the illness, in terms of general pathological severity and the negative and positive symptoms separately. In Table 4 we exhibit the correlations

Table 3: Means, Standard Deviations, t-Tests, and Significance of Deviations of Learning Functions from the Norms (n = 38).

Learning function	M	SD	t	Cohen's *d*
Rapid naming				
Objects	-2.76	1.35	-12.90**	-2.04
Letters	-.67	1.42	-3.01*	-0.48
Digits	-.85	1.35	-3.97**	-0.63
Verbal fluency – retrieval				
By letter	-1.24	1.07	-7.35**	-1.16
By category	-1.68	.91	-11.66**	-.84
Decoding text				
Precision	-.19	1.56	-.76	-0.12
Reading speed	-1.52	1.50	-6.35**	-1.02
Dictation				
Writing efficiency	-7.72	5.17	-9.45**	-1.49
Basic errors	-1.61	4.00	-2.54*	-0.40
Other errors	-1.01	4.39	-1.46	-0.23
Arithmetic automation				
Precision	-8.68	7.06	-7.77**	-1.23
Time	-3.72	2.36	-9.95**	-1.57
Immediate recall				
From stage 1	-1.18	.85	-8.79**	-1.39
Improvement from stage 1-4	-1.19	1.15	-6.51**	-1.03
Delayed recall				
Fading from stage 4-5	-.15	.89	-1.07	-0.17
Recognition and precision in identification	-2.15	1.77	-7.67**	-1.21
Visual perception parallel processing	-4.18	4.42	-5.90**	-0.94

* $p < .05$, ** $p < .01$

between the degree of intra-individual learning functions and the different measures of severity of the illness.

The correlations were not significant in any of the measures. In other words, Hypothesis 3 was not confirmed by the findings.

Discussion

The research findings regarding the first two hypotheses are consistent with the results reported in previous literature on this subject. Reichenberg et al. noted that it is well known that schizophrenia is associated with neuropsychological deficiency [10]. In spite of the heterogeneity among the different individual cases, the typical neuropsychological profile of schizophrenia suffers is characterized by deficits in memory and learning, abstraction, executive functions, speed of processing information, and attention. The researchers examined the neuropsychological functioning of people suffering schizophrenia as well as other mental disorders. All groups demonstrated low scores in memory, executive functions, attention, and speed of information processing, but those with schizophrenia showed much greater decline in all cognitive areas examined in the research. Nevertheless, these researchers argued that the neuropsychological functioning of a significant minority of people suffering psychoses, including schizophrenia, is within the normal range. As noted, in the present research, examination of possible intervening variables that might affect the cognitive functioning of the research participants revealed a significant relationship of age of the first episode of the illness and times hospitalized with the correlation between these variables and rate of retrieval scores, and with the significant correlation found between times hospitalized and the writing task scores. This may be explained by the considerable difficulty that people with schizophrenia exhibit in performing executive functions. Speed of retrieval and writing are affected directly by the decline in executive functions; this may explain the difficulties that the research participants demonstrated.

An explanation of the significant difficulties the research participants had with writing processes might be based on the knowledge that writing requires a very high level of executive ability. Performance of a writing task requires a combination of cognitive and motor processes, and it is the product of cognitive and neuromotor development. Writing requires the integration of language, cognitive, and motor skills. There are several potential reasons for difficulty performing writing tasks, including medical, neurobiological, neuropsychological, and environmental factors. In the neuropsychological context, difficulties in fine motor skills, language, visuospatial ability, attention, memory, and serialization may be involved. In evaluating writing functions, it is important to consider different neuropsychological aspects that affect writing ability: working memory, speed of information processing, and aural retrieval and processing. In addition, executive functions such as attention are very important to good writing performance and should also be considered when evaluating writing processes [11]. As shown earlier, research has shown that executive functions are impaired among people suffering schizophrenia, in general, and this was true among the current research group, in particular. Among the research participants, we found a particularly significant decline in learning functions associated with the nonverbal syndrome. To the best of our knowledge, there is still no consensus on a single definition for the diagnosis of Nonverbal Learning Disabilities (NVLD). However, researchers have recently suggested models for NVLD diagnosis. An example is the model presented by Davis and Broitman [12 (pp. 13-19)], which is comprised of four subcategories. The first of these includes the existence of difficulties in the executive and visuospatial area. In the authors' view, these are the core difficulties in this disorder, and all those diagnosed for NVLD will display deficits in these areas. Those who fit this first category of the disorder will also demonstrate mild difficulties in the social and academic realms. The second subgroup includes difficulties in the visuospatial areas, as well as executive difficulties, which significantly lower social functioning. The third subgroup includes difficulties in visuospatial and executive realms, which considerably lower academic functioning. The fourth subgroup includes significant difficulties in all areas, in other words, the visuospatial, executive, social, and academic realms. The participants of the present research presented significant difficulties in functions associated with NVLD. The difficulties in rate of retrieval and speed of information processing were expressed in this research in difficulties in the following tasks: rate of retrieval of letters, objects, and digits; reading speed; writing; and arithmetic operations. These tasks are influenced considerably by the lowering of executive functioning. Furthermore, we also observed difficulties

Table 4: Correlations Between Intra-Individual Variance in Learning Functions and Severity of Illness (n = 38).

	Intra-individual variance	Positive symptoms	Negative symptoms	General psychopathology	Total PANSS score
Intra-individual variance		.05	.15	-.19	-.01

in visual perception, which are also associated with the characteristic difficulties of the nonverbal syndrome.

The findings in this research that reveal difficulties in general learning functioning, as well as verbal memory among people who suffer schizophrenia are consistent with the findings of research published in 1991, which indicated that schizophrenia sufferers demonstrate a general weakness in neuropsychological functions, relative to healthy people, and a significant decline in learning and memory. The researchers also noted the possibility that low attention functions, particularly organizational strategies, might explain these memory deficits [13].

In a review of meta-analyses on the neuropsychological functioning of people who suffer schizophrenia, Reichenberg and Harvey [14] found that the different studies consistently included findings of declarative memory deficits. All the reviews in this field reported a serious deficit in immediate and delayed verbal memory, similar to the findings of the present research.

In this research, we also found that a considerable portion of the functions that declined in people with schizophrenia were functions associated with processing speed, such as arithmetic automatic and visual perception. A deficit in processing speed among people with schizophrenia is a common finding in the literature. Leonard and colleagues [15] noted that the cognitive profile of schizophrenia patients is very heterogeneous, but difficulties in processing speed is a consistent finding, even among patients considered to function well. The question arises whether processing speed is influenced by other mediating factors, such as severity of the illness, premorbid IQ, or dosage of medication. Knowles and colleagues [16] examined this question in a meta-analysis. Based on examination of articles published between 2006 and 2009, they concluded that several mediating factors, especially the dosage of anti-psychotic drugs, affect the processing speed of people with schizophrenia. In comparison, others have argued that cognitive deficits are a central component of schizophrenia and not a secondary effect of drug therapy [17]. These researchers claimed that cognitive deficits should be considered a third group of symptoms of the illness, in addition to positive and negative symptoms. Some have also contended that a cognitive deficit can be discerned even during the first episode of the illness, indicating that it is not a result of medication. It would be interesting in future research to examine the effect of medication further. For instance, the dosage of antipsychotic drugs could be transformed to chlorpromazine equivalents, followed by an analysis of correlation with basic learning functions.

Study of the response speed of people with schizophrenia has also revealed that procedural learning, as measured by series of time response tasks, is impaired among people with schizophrenia. The researchers differentiated between declarative learning and procedural learning. Declarative, explicit learning involves considerable awareness of the subject matter learned; it is significant in most neuropsychological tests, as well as tasks of recall and identification. In contrast, procedural, implicit learning is measured in tasks where the respondent is not required to provide a verbal explanation of his or her knowledge, skill, or ability. It is usually measured in perceptual motor tasks, such as skating or bike riding, and even skilled people have difficult explaining what they learned. This meta-analysis [18] was initially intended to prove that procedural implicit learning is maintained among people suffering schizophrenia. However, after analyzing nine studies in this field, the researchers concluded that typically, people with schizophrenia also demonstrate a decline in procedural learning, as measured by series of response time tasks, and they that it was too early to establish that cognition among people with schizophrenia is characterized by completely normal functioning in procedural learning tasks [18].

The significant difficulties demonstrated by the participants of the present research in reading speed, as well as the different measures of writing (spelling, handwriting) are not consistent with the findings of earlier studies. Quite a few studies have examined the area of language. In most cases, the measurement of reading and writing is carried out by means of reading or writing single words, an ability that is acquired at a relatively early stage of life. The review of meta-analyses on the cognitive functioning of people with schizophrenia indicates that in most cases, the researchers have found that people with schizophrenia functioned almost as well as those in the control group [14]. In other words, the findings revealed that reading and writing ability is usually maintained after the first episode of the illness. In contrast, we found that the reading speed of the people with schizophrenia was significantly lower than the norm, but the level of reading accuracy was maintained. A possible explanation for this is that reading speed is related to general processing speed, which, as noted, is known to be impaired among schizophrenia patients and it not necessarily associated with a decline in a specific area of reading. This suggests that the difficulty lies in reduced efficiency of processing and not a problem in the basic mechanisms of reading, such as phonological failure. This might also be the explanation for the decline found in the area of writing. In this research, writing ability was measured by means of dictation of a paragraph. The speed of the dictation was adapted to the average speed of healthy adults, as measured in the MATAL development research. The writing efficiency of the research participants, people with schizophrenia, was found to be significantly lower than the norm; this, too, may be due to a low processing speed, as well as low motor speed. In their meta-analysis, Dickinson, Ramsey, and Gold [19] found moderate to severe difficulties in simple motor speed tasks among people who suffered schizophrenia. In addition, three types of deficits in grapho-motor functioning are frequent among adolescents and adults with both specific learning disabilities and ADHD: deficits in symbolic ability, deficits in motor speed, and dyspraxia. Learners with ADHD are usually characterized by deficits in motor speed [11]. This is consistent with the difficulties that the present research population demonstrated, and may help explain the difficulties the participants had in writing.

The findings of the present research did not support our hypothesis regarding the relationship between severity of the disease

and the degree of internal variance in the cognitive functions of people with schizophrenia. No significant correlation was found between the severity of the illness, as measured using the PANSS questionnaire, and the degree of intra-individual variance in learning functions among the people with schizophrenia. It is important to examine the possibility of such a relationship, as researchers have recently shown interest in the question of whether heterogeneity in cognitive impairment among people with schizophrenia reflects heterogeneity of the symptoms that characterize the illness [20]. This question serves as the basis for examining a differentiated relationship between cognitive functions and positive and negative symptoms of schizophrenia. Our review of the relevant research revealed some consistency in the documentation of a relationship between negative symptoms and the severity of neurocognitive deficits. In a 1999 study, a significant relationship was found between cognitive deficits and the severity of negative symptoms. Patients who functioned better in cognitive tasks demonstrated less severe negative symptoms. In the same research, no relationship was found between cognitive functioning and positive symptoms [17]. In general it can be said that there is no consensus, and no consistency was found in the studies that examined these directions of investigation. In order to address this question, we examined the possible correlation of the degree of variance in learning functions with general severity of the illness, and with the severity of negative and positive symptoms separately. As noted, our findings, which indicated no significant relationship between severity of the disease and the degree of internal variance in specific learning functions, contradict previous research results. For example, Reichenberg and colleagues [6] found a relationship between greater intra-individual variance in intellectual performance and the risk of having schizophrenia, among individuals whose intelligence was defined as within the average range. Previous studies have also found that negative symptoms and cognitive deficits share many common components, and in most cases, indicated a correlation in their respective severity. Harvey and colleagues [21] examined whether a relationship between these variables is the result of their being similar symptoms or outcomes of the same factor, or if the nature of the relationship between cognitive symptoms and negative symptoms is affected by other factors, such as the way each of them is defined. This question has both etiological and therapeutic implications. The researchers pointed out that negative symptom are defined in terms of clinical observations, but cognitive symptoms are defined in terms of task performance. They reached the conclusion that cognitive and negative symptoms are distinct from one another, and have separate practical implications.

Diagnosis of cognitive processes among people with schizophrenia has practical implications regarding their future functioning in society. It has been found that cognitive weakness is significantly related to adjustment to "real life" more than negative symptoms are. Nevertheless, the researchers argued, it may be that neuropsychological performance is related more to the ability to perform real life skills and negative symptoms are related to the probability of actually performing these skills [21]. Whichever the case, it is evident that diagnosis of different groups of symptoms in schizophrenia is significant regarding the chances of these patients to integrate in and adjust to society.

Neuroactive research among people with schizophrenia may contribute to a better understanding of the pathophysiology of schizophrenia, and also support the improvement of treatment. Such improvement would probably contribute not only to cognitive performance, but also to the quality of life of people suffering from this complex illness [17]. A 2000 meta-analysis of studies in the field of neurocognitive functions in schizophrenia examined the relationship between functions and the functional outcomes among the patients: community and routine activities, social problem solving and the acquisition of psychosocial skills. The results showed that between 20% and 60% of the variance in the functioning of the patients could be explained by general neurocognitive functioning. Examination of specific areas revealed that delayed memory was related to and predicted all the areas of functioning examined, and functioning in immediate memory tasks was a predictor of the patients' psychosocial functioning. Verbal fluency was found to predict the functioning of the patients in routine tasks in the community [22]. In a more recent study, the researchers examined the relationship between verbal memory, processing speed, negative symptoms, and the ability to function in schizophrenia. The results indicated that verbal memory, processing speed, and negative symptoms contributed significantly to the functional ability of the patients [23].

Conclusion

In the present research, we investigated which specific cognitive areas are impaired after the first episode of schizophrenia. The results add to the existing knowledge, which has concentrated mainly on the general cognitive status of people with schizophrenia. Specifically, they shed light on the heterogeneity of neurocognitive impairment among people with this illness. Thus the present research contributes to a better understanding of the pathophysiology of such patients and may potentially inform more focused and appropriate treatment in the cognitive realm. Furthermore, improved treatment may offer these patients benefits beyond those related to cognitive performance; it may contribute to improvement in their quality of life, as well.

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