



Relation of Verbal Memory Dysfunction with Type and Severity of Psychiatric Symptoms in Schizophrenic Patients

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Abstract

Background: Cognitive dysfunction, especially memory impairment is common in schizophrenia.

Objectives: According to impact of memory problems on everyday life of schizophrenic patients, this research intended to assess the relationship between memory and behavioral signs of these patients for better therapeutic decision.

Methods: In this cross sectional study, seventy one schizophrenic patients admitted at Razi psychiatric hospital (Tehran, Iran) from July to December 2015, were included. Verbal memory was analyzed by Persian translated Wechsler memory subtests (WMS-III) of paired associates, recognition and numerical memory. Positive and negative symptoms scale (PANSS) for schizophrenia is used for evaluation of psychiatric symptoms. Data were analyzed with a statistical software program (SPSS 20).

Results: Word association memory has a significant correlation with negative signs, positive signs, excitement, anxiety and depression ($P < 0.05$). Also, numerical memory has an inverse correlation with disease duration. Regarding to sex differences, word association memory has a significant correlation with positive signs, anxiety and depression in male patients but in women, only excitement showed positive correlation with word matching memory ($P < 0.05$).

Conclusions: There is significant relation between verbal memory dysfunction and type and severity of psychological symptoms of schizophrenia patients. So, routine evaluation and treatment of these cognitive impairments should be considered as a part of comprehensive schizophrenia therapeutic approach.

Keywords: Schizophrenia, Verbal Memory, Positive and Negative Signs

1. Background

Schizophrenia is one of the most important problems of public health and hygiene in the world such that the world health organization put it among the first ten diseases which causes global burden of diseases [1]. This disease which causes major cognitive, behavioral and emotional dysfunctions, affects patient's quality of life and family members of schizophrenia patients experience high level of emotional and financial strains [1, 2].

During last decades, there were many studies about cognitive functions in Schizophrenia patients. Most studies confirmed cognitive involvements especially of attention, memory and executive functions in all stages of schizophrenia [3-5]. Some researchers consider cognitive disorders as a main characteristics of schizophrenia and they report two main reasons for this. At first, many of these studies show that cognitive disorders appeared before psychosis and their presence may predict schizophrenia development in high risk groups. The second reason is that cognitive impairments will stay relatively stable

during remitting phase of psychological symptoms and mostly, all-over the disease course [6, 7].

Meanwhile, memory dysfunction is one of the most important aspects of cognitive defects in schizophrenia patients and this is against of early schizophrenia pioneers' ideas like Krapelin which thought memory function will remain intact among these patients. Recent studies show that memory disorders that present at the first disease attack will remain unchanged during disease course. However, older patients with chronic schizophrenia had faster cognitive decline including memory dysfunction in comparison with their healthy peers [8]. Early researchers that found cognitive dysfunctions of schizophrenia patients, considered it secondary to psychological signs of the patients or drug side effects but subsequent studies showed that cognitive impairments are independent phenomenon in schizophrenia [3]. This conclusion was based on findings that showed there was no relation between behavioral and cognitive symptoms of schizophrenia patients and at the other hand, anti-psychotic drugs were

not effective on cognitive dysfunctions of the patients [9-11]. So, it should be expected that cognitive symptoms such as memory dysfunction are not affected by severity of psychological signs and disease chronicity but recent studies showed that verbal memory, one of the most important involving memory subscales in schizophrenia, is associated with more emotional distress, lower quality of life and inadequate social performance in the patients [12-14] and accordingly, we expect that cognitive and behavioral symptoms of schizophrenia influencing each other and patient's cognitive abilities decrease parallel to disease deterioration due to progressive social isolation, emotional disruption and life quality deterioration.

Then, according to impact of memory dysfunction on everyday life of schizophrenia patients, it seems necessary to re-assess the relationship between memory and behavioral signs of schizophrenia patients that will lead to better therapeutic decisions.

2. Methods

This research is a cross sectional study to determine the correlation between verbal memory impairment and type and severity of psychological signs of schizophrenia patients. Statistical population of this research includes all patients with schizophrenia that were hospitalized from July to December 2015 in Razi Psychiatric hospital located at Tehran and they were selected by availability. Diagnosis of patients was confirmed based on criteria for diagnostic and statistical manual of psychiatric disorders (DSM-V) by a psychiatrist. The sample consisted of 23 female and 48 male patient with schizophrenia. Informed consent was signed by all participants. Having 18 years or older, ability to read and write, having full vision and hearing and having psychological signs for at least 6 months are prerequisite for inclusion. Patients with debilitating medical illness (like liver failure, severe heart failure, diabetes, hypothyroidism, severe anemia which affects memory), neurological illnesses (like epilepsy, stroke and mental retardation) and patients with history of substance abuse were deleted from this survey.

Data was collected after obtaining necessary permits from hospital and informed consent from patients by questionnaire. The researcher described instructions of questionnaires for participants and then completed them individually in a room without tension and insecurity. Completion of questionnaire took about 40 to 45 minutes for each participant.

In this research we used 3 questionnaires for collecting data:

1- Researcher made a demographic questionnaire including individual characteristics (gender, age, job, marital status, education and disease duration).

2- Verbal memory was analyzed by Persian translated Wechsler memory subtests (WMS-III) of paired association, recognition and numerical memory. In pairing up words, the participant should remember the second word from each pairs after hearing 25 pairs of words. In recognition test which involves in 120 words, 30 minutes after hearing list and having mind activity, the other researcher gives list of words to participant and asked him to put a multiply in front of each words that heard before. In test of numerical memory (digit span), they give list of 3 to 9 numbers orally to the participant and then they asked him to say them again. Orangi et al. (2002) approved the reliability and validity of the Persian form of WMS-III tests: the reliability coefficient was up to 0.98 for subtests and validity was satisfactory [15].

3- Positive and negative symptoms scale (PANSS) for schizophrenia is used for checking the antipsychotic treatments. It formed from 5 subscales and 30 questions and participants will respond according to Likert type scale including: at all, sometimes, average, high and very high. The symptoms included are negative (8 questions), positive (6 questions), disruption (7 questions), excitement (4 questions), anxiety and depression (5 questions). The interrater reliabilities of the scale were in the 0.80's and the validity was also adequate [16].

For data analysis, SSPS-20 software package was used and variables were analyzed by linear regression test and Pearson correlation.

3. Results

The participants of this study consisted of 71 patients (23 women) suffering from schizophrenia. Most participants (39.4%) were between 26 and 35 years old, while only 5.6% were older than 45 years.

Based on the results presented in Table 1, the most prevalent sign among patients was negative signs (23.34) and the lowest mean was observed to be for the numerical memory scale (5.18).

In order to investigate the correlation between verbal memory (word-matching memory and numerical memory) and psychological signs (negative signs, positive signs, disruption, excitement, anxiety and depression), Pearson's correlation coefficient was employed. According to Table 2, matching memory has a significant correlation with negative signs ($r = -0.259$), positive signs ($r = 0.309$), excitement ($r = 0.313$), anxiety and depression ($r = 0.308$).

The presented results indicate that in Schizophrenic patients, negative signs have an inverse correlation with

Table 1. The Descriptive Statistic Indices of the Main Variables of Schizophrenia Symptoms and Memory Subscales

Variables	Mean	Standard Deviation	Min	Max
Negative sign	23.34	4.154	14	32
Positive sign	21.51	3.953	13	28
Disruption	23.13	3.009	16	29
Excitement	13.89	2.959	8	19
Anxiety-depression	15.11	4.123	5	22
Word matching	15.34	6.006	3	25
Numerical memory	5.18	1.175	3	8

Table 2. Pearson's Correlation Coefficient for Verbal Memory Subscales and Psychological Signs

Variables	Negative Signs	Positive Signs	Disruption	Excitement	Anxiety and Depression
Word-matching memory					
Pearson correlation	-0.259	0.309	0.151	0.313	0.308
P value	0.029	0.009	0.209	0.008	0.009
Numerical memory					
Pearson correlation	0.087	0.007	0.171	-0.088	0.043
P value	0.472	0.951	0.154	0.463	0.719

word-matching memory. However, there was not a significant correlation between numerical memory and psychological signs.

As could be seen in Table 3, no significant correlation existed between word-matching memory and disease duration ($r = 0.055$), but the correlation was significant for numerical memory ($r = 0.268$). These findings indicate that numerical memory has an inverse correlation with disease duration.

Table 3. Pearson's Correlation Coefficient for Verbal Memory Subscales and Disease Duration

Variable	Word-Matching Memory	Numerical Memory
Disease duration		
Pearson correlation	-0.055	-0.268
P value	0.647	0.024

Word-matching memory has a significant correlation with positive signs ($r = 0.382$), anxiety and depression ($r = 0.308$) in male patients. On the other hand, there is no significant correlation between numerical memory and psychological signs in male schizophrenic patients. The results with regard to the word-matching memory and psychological signs in female schizophrenic patients demon-

strates that among all the correlations, only the word-matching memory variable has a positive correlation with excitement ($r = 0.721$), indicating that the increase or reduction in excitement would result in the increase or reduction of word-matching memory in female schizophrenic patients. Also, the results indicated no significant correlation between numerical memory and other psychological signs in female schizophrenic patients.

4. Discussion

Findings of this research showed that there is significant relations between verbal memory dysfunction and type and severity of psychological symptoms of schizophrenia patients; among these relations is an inverse relationship between negative symptoms and memory for pairs of words. It means there is a deterioration in word-pair association memory with expanding of negative symptoms of schizophrenia patients but numerical memory has no significant association with behavioral schizophrenia symptoms. In the other hand, our results showed that subscales of numerical memory is related to disease duration i.e. with extending disease course, verbal memory performance deteriorates. These findings will challenge common ideas about memory function in schizophrenia patients.

Table 4. Pearson's Correlation Coefficient for Psychological Signs and the Sex of the Patients

Variables	Negative Signs	Positive Signs	Disruption	Excitement	Anxiety and Depression
Word-matching memory in male patients					
Pearson correlation	-0.198	0.382	0.160	0.109	0.308
P value	0.177	0.007	0.279	0.461	0.033
No.	48	48	48	48	48
Numerical memory in male patients					
Pearson correlation	0.199	-0.019	0.148	-0.001	0.000
P value	0.176	0.898	0.317	0.992	1.000
No.	48	48	48	48	48
Word-matching memory in female patients					
Pearson correlation	-0.312	0.075	0.125	0.721	0.303
P value	0.147	0.732	0.571	0.000	0.159
No.	23	23	23	23	23
Numerical memory in female patients					
Pearson correlation	-0.038	0.061	0.231	-0.297	0.145
P value	0.862	0.783	0.288	0.168	0.509
No.	23	23	23	23	23

Abbreviation: No., Number.

In a meta-analysis that analyzed more than 70 surveys, long term (free recall, recall with cues, verbal and non-verbal recognition) and short term memory (whole numbers) of schizophrenia patients were assessed [9]. In this meta-analysis, Aleman et al. concluded that only negative symptoms are related to memory dysfunction that is in agreement with our study; but they didn't find any relationship between severity of memory impairment and age, consuming drugs, disease course, severity of mental pathology and positive symptoms of the patients. On the other hand, some studies showed different results. In a study, Hughs et al. assessed a spectrum of psychological and cognitive symptoms in chronic schizophrenia patients [17]. In the early stage of disease, severity of negative symptoms was associated with lower scores in cognitive tests such as verbal memory; but in second assessment at 6 months later this association was disappeared. The authors doubted about causal relationship between psychological and cognitive symptoms of schizophrenia and suggested the interaction between these symptoms would be different with disease progression so that in newly diagnosed patients, cognitive impairments may improve in parallel to improvement of psychological symptoms but in chronic patients such relation does not exist. Our study also showed effect of disease duration over some aspects of memory functions and this controversial relation of dis-

ease course with cognitive function can be due to this possibility that chronic schizophrenia is an entirely separate disease entity with different etiology or cognitive performance. On the other hand, as disease progresses, other confounding factors such as drugs and hospital admission may affect cognitive and behavioral symptoms of chronic patients.

In the other study, Bilder et al. assessed the relation between cognitive performance and psychological symptoms in the first attack of schizophrenia [18]. They didn't find any relation between neuropsychiatric test scores and psychotic symptoms in the patients; however, depressed mood was associated with verbal memory dysfunction. In a different approach, McDermid Vaz et al. divided schizophrenia patients into two groups of normal and impaired memory and discovered that patients with poor memory had more positive symptoms and lower quality of life [19]. In return, Addington didn't find any relation between positive symptoms and cognitive performance [8]. However, like other studies (such as our survey) this author found a significant relation between negative symptoms and cognitive disorder. In the first disease attack, negative symptoms was related to executive measures and visual and verbal memories but one year after disease onset, this association would be just with executive performance and verbal memory [8].

Findings of our research showed that disease progression would affect some domains of cognitive function: performance of digit span test deteriorates by prolonging disease course. Some studies such as Aleman et al. [9] concluded that deterioration of cognitive impairment was not occurred with increasing patient's age and disease duration. Beyond that, some authors believe that schizophrenia is a static encephalopathy [20], i.e. disease pathology is steady in cognitive domains and involvement of neural circuits does not spread over time. Contrary to these statements, our study proposes a dynamic pathologic process; memory of digit span as a verbal working memory is related to frontal lobe function and on the other hand, frontal lobe dysfunction is responsible for some behavioral schizophrenia symptoms especially negative ones [21]. So, according to these findings it can be suggested that cognitive dysfunction resulting from frontal lobe pathologies enhances over time with disease progression i.e. as negative symptoms worsen, patient's ability to activate frontal lobe decreases during cognitive tasks.

In this research, there is no relation between paired associates memory (as an episodic verbal memory mostly related to temporal lobe function) and disease duration. In fact, this finding is in agreement with previous studies that highlight schizophrenia as a disease with selective brain involvement not as a widespread uniform brain pathology [22]. So, we may propose this hypothesis that more than other brain areas, frontal lobe pathologies of schizophrenia are prone to worsen over time.

The relation between paired associates memory and negative symptoms of patients can be better understood by recent findings on neuropathology of schizophrenia [23]. Frontal and temporal lobes are more accountable than other brain areas for producing psychotic symptoms and disruption of connectivity networks between temporal limbic areas and pre-frontal lobe is probably responsible for relation between memory and negative symptoms [22]. Also, we present this hypothesis that temporal lobe dysfunction probably play a limited role in manifestation of negative schizophrenia symptoms as some recent studies proposed [24].

The correlation found in our results of paired associates test (in comparison to digit span test) can also be explained on another view; paired association is essentially a learning process and accordingly, in a comprehensive review by Cirillo et al., most impairments of verbal memory of schizophrenia patients were in learning (encoding) stage and forgetting rate was subtly impaired [12]. Gold et al. also confirmed this results by examining the level of initial and delayed recall of stories and visual figures in a group of 76 patients with schizophrenia [25]. They suggested a primary deficit in the initial acquisition of

information rather than an enhanced forgetting rate in schizophrenia. Accordingly, test of digit span that requires mainly attentional function not active learning, is affected less prominently in schizophrenia patients. However, some studies doubted these findings and emphasized that all aspects of verbal memory are affected equally [26].

This study, like similar previous researches cannot describe a definite mechanism for memory dysfunctions of schizophrenia. However, it may be proposed that temporal (including hippocampal) and frontal lobes dysfunctions are important pathophysiological processes, although more researches are required.

Findings of this research have important clinical results in management of schizophrenia patients. Cognitive disorders such as memory dysfunction have significant effects on treatment and rehabilitation of schizophrenia patients and exact knowledge of these cognitive impairments and their relation to symptoms of patient can lead to effective treatment protocols and prevent from treatment failure. For example, treatment plans that need high learning skills are prone to failure especially in patients with negative psychological symptoms. In the other hand, memory rehabilitation may enhance treatment response in refractory cases.

This study has some limitations. Assessment of some memory subscales cannot represent whole memory function and its pathology in schizophrenia patients. The other limitations of this study is lack of patient's follow up in a determined interval after the first evaluation, because with following up the patients, the dynamic characteristics of schizophrenia pathology can be sought more obviously. So, further studies are suggested using more comprehensive test batteries for memory and other aspects of cognitive functions over an extended period of follow up to unfold stronger relations between behavioral and cognitive symptoms of schizophrenia patients.

4.1. Conclusion

This study showed that verbal memory dysfunction has a significant correlation with type and severity of psychological symptoms of schizophrenia patients. So, it is important to evaluate cognitive status especially memory function of the patients before planning any treatment for behavioral schizophrenia symptoms.

Footnotes

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