

SPATIAL MEMORY FUNCTIONING AND NEGATIVE SYMPTOMS IN SCHIZOPHRENIA

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Abstract: Background: Cognitive deficits in schizophrenia have been attributed to information processing deficits or to working memory). Spatial working memory (SWM) deficits in particular have been proposed as potential cognitive endophenotypic markers of schizophrenia. Aims: The aim of the current study was to compare the performance of patients with schizophrenia with that of healthy controls on tests of spatial memory in order to identify specific pattern of memory performance. Subjects: 138 outpatients with a diagnosis of schizophrenia were recruited from the Community Mental Center Cluj-Napoca and were assessed with three spatial memory tests from CANTAB. Results: Significant group differences were observed in cognitive performance. Conclusions: Schizophrenic patients showed impairment in spatial memory in comparison with healthy control subjects. Impaired performance can be attributed to negative symptoms.

INTRODUCTION

Cognitive deficits in schizophrenia have been attributed to information processing deficits or to working memory.(1)

Working memory (WM) refers to the maintenance (short-term storage and rehearsal) and manipulation of verbal and visuospatial information. Working Memory deficits are considered a cardinal cognitive feature of schizophrenia.(2) Spatial working memory (SWM) deficits in particular have been proposed as potential cognitive endophenotypic markers of schizophrenia.

Study have showed that patients with schizophrenia have substantial memory deficits (3), that are disproportionate to the general level of intellectual impairment and other aspects of cognitive function.(4) It appears that multiple aspects of memory are affected because deficits have been reported in working memory (5), semantic memory (6), recognition memory (7) and recall.(8,9)

PURPOSE

The aim of the current study was to compare the performance of patients with schizophrenia with that of healthy controls on tests of spatial memory in order to identify specific pattern of memory performance. Our working hypothesis is that the patients with negative symptoms are more impaired in spatial memory.

METHODS

Subjects

138 outpatients with a diagnosis of schizophrenia were recruited from the Community Mental Center Cluj-Napoca. The diagnosis of schizophrenia was determined according to the criteria of the ICD-10.

Subjects with neurological illness or head trauma, a history of alcohol or drug abuse, an estimated IQ below 70

were excluded from the study or age under 18 or over 60 years old were excluded from the study. Patients with schizophrenia were divided into the “with negative symptoms group” and without negative symptoms group” according to Positive and Negative Syndrome Scale (PANSS), negative score below or above 19. A group of 43 control participants was recruited from a community sample with no psychological background.

Exclusion criteria for the controls included a history of mental illness within first-degree relatives and the presence of a medical illness that might impair cognitive functioning.

Measures

Clinician-rated measures

The Romanian version of the PANSS (10) was used to measure the psychopathology of patients. Patients who scored higher than 19 on PANSS negative scales were included in the negative symptoms subgroup of schizophrenia.

Spatial memory assessment

Spatial memory was assessed with the three tests from CANTAB.(11)

Cambridge Automated Neuropsychological Testing Battery (12) is a computerized battery of tests that are presented on a touch screen computer.

The CANTAB was selected for this study because of its advantages of efficiency, the achievement of highly standardized administrations, and automated response recording that would be difficult to accomplish by hand. For example, response times can be recorded with millisecond precision, which can be important for scoring purposes.(13)

Spatial Span

This is a computerized analogue of the Corsi block-tapping test and requires the subject to observe and remember the sequence and location of a series of boxes changing colour. Scoring on this test is in terms of the maximum sequence of squares changing colour that the subject could successfully follow (between 2 and 9).

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CLINICAL ASPECTS

Spatial Working Memory

This test requires the subject to search through an increasing number of boxes on the computer screen in order to locate tokens. Once a token has been found in a particular box, another will not appear in the same box and therefore the subject has to keep track of the locations where they have previously found tokens and remember not to re-search that box. The main type of error that is recorded on this test is a between-search error when the subject returns to a box where a token was previously found. In addition, a score representing the strategy used to complete the task is also recorded.

Spatial recognition memory

Subjects were required to learn the on-screen spatial location of five unfilled, white squares, appearing one at a time in different locations on the screen for 3 seconds. In the recognition phase, two squares appeared simultaneously on the screen and the subject had to target the familiar one. The procedure was repeated three more times using new locations for the target. The subject was given a total correct score expressed as a percentage.

Data analysis

The data were analyzed using SPSS version 20. Analysis of variance (ANOVA) or chi-square tests were performed to compare demographic and neuropsychological variables. Cognitive data were not normally distributed so we used non-parametric statistics for comparisons (Kruskal-Wallis test).

RESULTS

Demographic and clinical variables

The demographic data obtained from the schizophrenia group and the healthy controls are presented in table no. 1. The three groups did not significantly differ in gender and age.

Table no. 1. Demographic and clinical variable

	Schizophrenia with negative symptoms	Schizophrenia without negative symptoms	Healthy controls		P
Gender (males)	15.4 %	15.1 %	25.6 %	Chi-square 2.42	>.05
Age (years)	39.3	37.7	36.14	F 2.3	>.05
PANSS negative	24.6	14.5			

Comparison of memory functioning among patients with or without negative symptoms schizophrenia and healthy controls.

The scores for spatial memory functioning are presented in table no. 2 and figures no. 1, 2 and 3.

Table no. 2. Cantab scores

	Control		Schizophrenia without negative symptoms		Schizophrenia with negative symptoms		Kruskal-Wallis test	P
	Mean	SD	Mean	SD	Mean	SD		
SRM Number correct	17.12	1.54	13.14	2.99	13.79	2.69	32.27	<.001
SRM Percent correct	85.58	7.73	65.69	14.99	68.97	13.48	39.08	<.001
SSP Span length	6.77	1.26	4.6	1.22	4.38	1.46	65.81	<.001
SSP Total errors	12.12	6.65	11.09	4.72	12.01	5.44	1.9	>.05
SWM Strategy	66.02	32.15	36.64	7.32	32.53	13.74	57.49	<.001
SWM Total errors	15.11	16.42	36.10	22.34	51.10	28.91	57.43	<.001

Figure no. 1. Independent Samples Kruskal-Wallis test for SWM Strategy

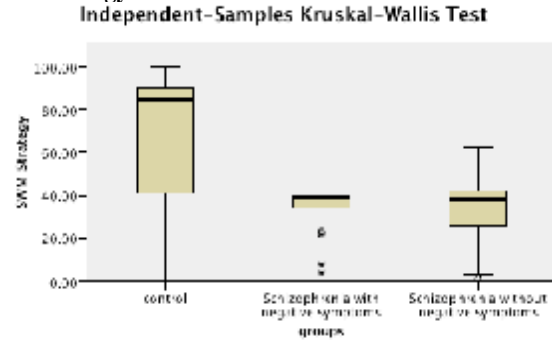


Figure no. 2. Independent Samples Kruskal-Wallis test for SSP Span length

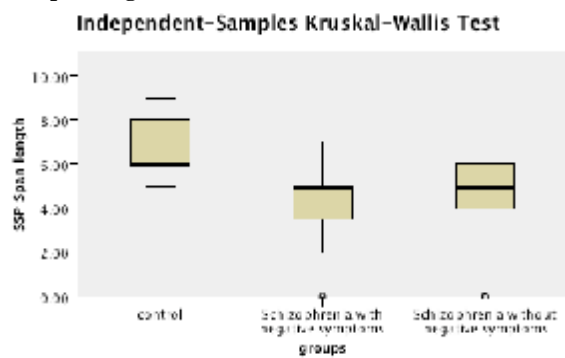
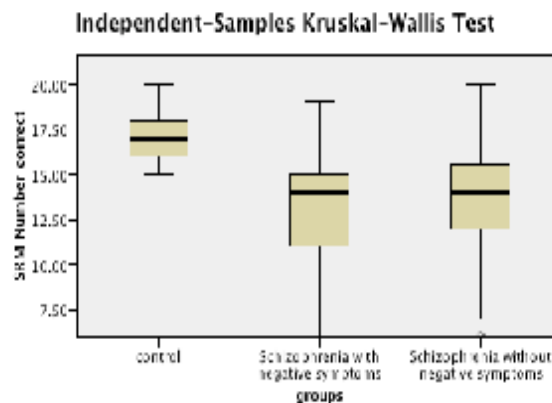


Figure no. 3. Independent Samples Kruskal-Wallis test for SRM Correct number



Significant group differences were observed in cognitive performance. Schizophrenic patients showed impairment in spatial memory in comparison with healthy control subjects.

DISCUSSIONS

The aim of this study was to examine various aspects of spatial memory in patients with schizophrenia.

Independent sample Kruskal-Wallis tests were used to analyze memory performance in patients and controls. Patients performed significantly worse (and/or below normative levels) than controls and negative symptoms influence memory performance.

Other studies (14) have showed that patients with schizophrenia exhibited impairments in major cognitive domains when compared to gender and age matched healthy controls. Impairments were evident in psychomotor speed (slower response latencies), sustained attention, episodic memory (spatial memory) and in two sub-domains of executive-function (spatial working memory and cognitive planning/organization).

Hence, as with the majority of previous studies (9,15), the current study accords with the notion that spatial memory function is substantially impaired in schizophrenic patients.

CONCLUSIONS

Schizophrenic patients showed impairment in spatial memory in comparison with healthy control subjects. Impaired performance can be attributed to negative symptoms.

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