Research Article

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Short Neuropsychological Assessment in Schizophrenic Patients

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ABSTRACT

Patients with schizophrenia show deficits in executive functions, resembling patterns also found in frontal lesions. The advent of these findings shows the need for appropriate short neuropsychological screening tests in order to assess cognitive function in schizophrenia.

Method: We gathered data from a patient group with schizophrenia, and from a control group. We administered 3 short, fast screening tests: MOCA (Montreal Cognitive Assessment), MMSE (Mini Mental State Exam) and FAB (Frontal Assessment Battery).

Results: All 3 test were found to be highly correlated with each other, with MOCA being a predictor factor for FAB scores. In measuring the 3 tests' sensitivity to schizophrenia associated cognitive impairments, we found that FAB was the most sensitive among the three.

Conclusions: Our goal was to examine the utility of the FAB test when screening for cognitive deficits in Greek patients with schizophrenia. We found that FAB can be a valuable tool in neuropsychological assessment, but given the varied nature of patients with schizophrenia cognitive profile, it should be accompanied with an extensive battery of tests.

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Schizophrenia

The enormous complexity of the structure and function of the brain and the difficult access to it as it is well hidden inside the skull made it difficult to study. The relatively recent development of various methods of structural and functional imaging of the brain has made it possible to reveal much data about its normal function and how it is disturbed in mental illnesses such as schizophrenia.

The presence of a number of differences in the brains of people with schizophrenia compared to the brains of non-sufferers has been documented. These differences are not found in all patients but in 50-65%. Similar smaller differences may occur in 1/3 of first-degree relatives of people with schizophrenia, but also in a small percentage of people in the general population. Due to this overlap these differences cannot be used for diagnostic purposes [1].

Studies that use neuropsychological tests and imaging technologies of the brain, such as fMRI and PET to examine functional differences in stroke activity have shown that the most commonly seen differences occur in the frontal lobes, hippocampus and temporal lobe. Reductions in brain volume, smaller than those found in Alzheimer's disease, have been reported in areas of the frontal cortex and temporal lobe. It is uncertain whether these volumetric changes are progressive or pre-existing before the onset of the disease. These differences have been linked to psychometric deficits, which are often associated

with schizophrenia. Because neural circuits change, it has been suggested alternatively that schizophrenia should be considered a collection of neurodevelopmental disorders [2].

In AHEPA 3d Department psychiatry clinic the neurocognitive short evaluation is conducted using the Montreal Cognitive Assessment (MOCA) test, the Mini Mental State Examination (MMSE) and the Frontal Assessment Battery (FAB). MOCA has been found to be a valuable clinical screening test for evaluating cognitive deficits in people with psychiatric symptoms [2]. However, it has been reported that MMSE is not sensitive enough to identify such deficits [3]. Since schizophrenia showcases a cognitive profile similar to frontal lesions, we suggest the use of FAB (Frontal Assessment Battery) as a screening tool to evaluate executive functions in patients with schizophrenia.

Executive functions

The term "executive functions" has been used synonymously with the term "frontal-lobe functions" and has its historical roots in attempts to delineate higher cognitive functions of the prefrontal cortex. Executive functions are involved in the maintenance and shifting of cognitive and behavioral responses to environmental demands permitting the control of action and longterm goal-directed behavior [4,5].

A great deal of research has focused on executive dysfunction in schizophrenia. First, many of the clinical features of schizophrenia are phenomenologically similar to those associated with frontal lesions, such as reduced spontaneity, avolition, mental rigidity, and lack of social judgment [6,7].

A second reason has to do with the dominant view about the etiology of schizophrenia. The so-called “neurodevelopmental hypothesis” postulates that schizophrenia arises from early, possibly fetal brain abnormalities of genetic and/or environmental origin which remains largely “static” or “silent” until it interacts with normal brain maturation processes, namely, those of the frontal lobes [8,9].

Frontal Assessment Battery (FAB)

Frontal Assessment Battery is a short neuropsychological executive function screening battery that evaluates frontal lobe function. It is easy to use, requires a short amount of time to administer and is free [10].

Both reliability and validity have been verified [11]. It has been found that FAB is sensitive in pinpointing mild deficits in executive functions [11,12]. Frontal Assessment Battery is used to examine deficits associated with frontal functions. The battery includes 6 short tests that cover all executive functions. The 6 sub-groups of tasks include:

1. Similarities (conceptualization)
2. Lexical fluency (mental flexibility)
3. Motor series “Luria” test (programming)
4. Conflicting instructions (sensitivity to interference)
5. Go-No Go (inhibitory control)
6. Prehension behaviour (environmental autonomy)

Each item is awarded 0-3 points for a total of 18 points. Scores under 12 are considered cut-off scores and are a sign of cognitive decline in executive functions [13].

Method

The sample of the research include 55 schizophrenic patients from the psychiatric Clinic in AHEPA hospital in Thessaloniki-Greece. The evaluation was conducted right after the participants exit the clinic. The participants had already been diagnosed with schizophrenia. Our goal was to examine whether FAB could locate potential declines in executive function tasks. Baseline demographics were gathered. From 55 patients, 43 (78,2%) were male and 12 (21.8%) were female. Their age varied from 41 to 75 years old ($M=55.95$, $SD=6.04$) and their educational level varied from 6 up to 22 years ($M=10.92$, $SD=3.21$). A control group was constructed to compare its scores with the patient group. The control group constituted of 26 people, 16(58.5%) being male and 10(41.5%) being female. Their age varied from 22 to 62 years old ($M=49$, $SD=8.27$) and their educational level varied from 6 up to 18 years ($M=12.35$, $SD=5.65$).

Three neuropsychological batteries were administered: MMSE, MOCA and FAB. We chose these batteries based on their good psychometric properties and the short amount of time necessary to administer them. Cut-off score for each test was: a) MMSE - <27, b) MOCA- <26, c) FAB- <12.

Results

We estimated correlations between the 3 administered screening tests using Pearson’s R. Statistically significant correlations were found between the screening tests. Frontal Assessment Battery was found statistically significantly correlated with the overall MOCA test ($r=.066$, $p<0.01$) as well as the MOCA executive function subtest ($r=0.6$, $p<0.01$). Frontal Assessment Battery was also found to be correlated with the MMSE test ($r=0.67$, $p<0.01$). Performing linear regression between MOCA, MMSE and FAB, we found MOCA is a predictive factor for the FAB test ($\beta=0.47$, $p<0.01$). This means that scores in MOCA can predict scores in FAB. We can also infer that MOCA can interpret 47% of the

variation in the 2 overall scores ($R^2=0.47$, $p<0.01$, $\eta^2=$ This was not found for the MMSE test. Comparing mean scores between the patient group and the healthy group in the FAB subtests, we find statistically significant differences in the overall scores of the 2 groups as well as in 5 out of the 6 subgroups. Patients tended to perform worse in programming, inhibitory control, conceptualization, mental flexibility and conflicting instructions ($p<0.000$).

The highest degree of sensitivity was found in Frontal Assessment Battery (0.862), followed by the MOCA test (0.725). MMSE’s roc curve analysis showed baseline results (0.52).

Discussion

A lot of neuropsychological assessment batteries used in schizophrenia studies have been adapted from clinical neuropsychology, which assesses the profile of neuropsychological strengths and weaknesses of an individual [14]. Various observations have led to the hypothesis that compromised cognitive functioning is a core feature of schizophrenia and not an artifact of other symptoms, treatment for the illness, or aspects of the course of the illness [15,16]. It has further been proposed that the well-known diversity of schizophrenia in terms of functional outcome and recovery from the illness is best characterized by cognitive deficits, not by the classical symptoms [17]. Many of the neuropsychological assessment batteries used are long and complex and require several hours to administer [18]. The adaptation of assessment batteries for schizophrenia research has kept some of the length that was originally necessary for individual assessment but may no longer be necessary for clinically oriented research [18]. Until recently there was no standard, easily administered test battery that specifically and efficiently assesses the important cognitive deficits in patients with schizophrenia.

Schizophrenia has been closely associated with impairments in executive functions. Difficulties lie in the peculiar cognitive profile depicted by schizophrenic patients, that might show cognitive impairment. Programming has been shown to be one of the most affected skill. Comparing control and patients groups, we found significant differences in executive function tasks, confirming our initial hypothesis- that the patient group with schizophrenia would score lower in executive function tasks. We also estimated the FAB, MOCA and MMSE tests’ sensitivity. Among the three neuropsychological tests, Frontal Assessment Battery scored the highest. Still, we cannot confidently say that Frontal Assessment Battery alone can be a clear indicator for pinpointing cognitive deterioration in schizophrenia, especially in patients undergoing treatment. When evaluating the effectiveness of schizophrenia psychiatric treatment, we must still consider the associated cognitive deficits. In our research, we found clear evidence for cognitive deterioration in executive functions. The complex nature of schizophrenia, which varies amongst patients undergoing treatment and amongst patients’ everyday function, leads us to believe that screening processes, although necessary, cannot be deemed sufficient conditions for evaluating their cognitive functions. Given that Frontal Assessment Battery measures clear deterioration in executive functions and the varied cognitive profile in schizophrenia, we estimate that it can be a valuable screening test, but should be administered as a part of an overall cognitive evaluation.

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