

THE USE OF THE MINI-MENTAL TEST STATE EXAMINATION IN DIAGNOSING THE MILD COGNITIVE IMPAIRMENT AND ALZHEIMER'S DISEASE

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Abstract: This paper aims at highlighting the main reasons for which the Mini Mental State Examination test (MMSE) is commonly recommended in clinical practice to be used for screening the cognitive function.

Cuvinte cheie: Mini Mental State Examination, tulburare cognitivă, demență Alzheimer

Rezumat: Lucrarea de față își propune să evidențieze principalele motive pentru care testul Mini Mental State Examination (MMSE) este frecvent recomandat în practica clinică de a fi utilizat în screeningul funcției cognitive.

MMSE test: structure and use

MMSE test is the most commonly used tool to assess the cognitive function. Folstein's MMSE was developed in 1975 to assess the mental state of psychiatric patients and to differentiate the organic or functional origin of their pathology.(1)

The experience of using this test has increased over time, reaching its major function is the detection and evaluation of cognitive impairment associated with the progression of neurodegenerative disorders and Alzheimer's disease (AD).(2)

MMSE test is structured in a series of questions that sums up 30 points, grouped in the following categories:

- Orientation in space: country, county, town, hospital, floor;
- Orientation in time: year, season, month, day, date;
- Register: immediate, repetition of words;
- Attention and concentration: successive decreases by 7, starting at 100 or reading a word at the end;
- Reminder: remembering previously repeated words;
- Language: to name two objects, to repeat a phrase, to read and understand a sentence, to write a sentence, the execution of three orders;
- Visual Construction: copying a drawing.

A number of MMSE abbreviated variants were developed in time, some of them assessing only orientation, attention, concentration, and recall.(3,4,5)

MMSE test is scored by summing the points awarded for each item, indicating low cognitive performance and severe cognitive impairment. A total score equal to 30 points indicates a better cognitive performance.(6)

The original recommendation was to use a cut off at 23 or 24, offering good sensitivity and specificity in detecting dementia; a series of recent studies suggest, however, that this cutoff is too low, especially in the people with high educational level. These studies have shown that dementia may be diagnosed with good accuracy in most cases at a score between 24 to 27 points regarding the MMSE. Due to clinical reasons,

even a score of 27 may be insufficiently sensitive in detecting dementia in individuals with high educational level, and a cutoff of 24 may be nonspecific in the people with low educational level.(7,8)

MMSE performance was found to be significantly correlated with a variety of other tests measuring intelligence, memory and other cognitive issues. For example MMSE score correlated significantly with the Wechsler Adult Intelligence Scale (WAIS) or with the revised scale (WAIS-R) in the patients with dementia, stroke, schizophrenia or depression.(5,8,9,10)

MMSE test performance is also strongly correlated with the Wechsler Memory Scale (Wechsler 1945) in the patients with dementia and neurological disorders and with the IMC (Information - Memory - Concentration) test score in the patients with Alzheimer's disease, individual cognitive disorders and normal psychological status.(10)

The MMSE test correlated significantly with the Clock Drawing Test scores in the elderly patients and in the patients with Alzheimer's disease and also with the score of the ADAS - COG (Alzheimer's Disease Assessment Scale) scale in the patients with AD or in the patients requiring psychiatric evaluation, but also with the score of the neuropsychological test index in the patients evaluated for dementia.(11)

One study finds the ADL (Activities of Daily Living) test or the IADL (Instrumental ADL) test with increased values in the patients whose MMSE score was ≤ 23 . There are three studies showing that the MMSE and the DRS (Dementia Rating Scale) correlate in the patients with dementia (N = 115, $r = -0.71$ - -0.86), in the patients with AD (N = 41, $r = -0.73$) and in the elderly patients who were not assessed for dementia (N = 226, $r = -0.86$). MMSE also correlates with the CDR (Clinical Dementia Rating Scale) in a study evaluating elderly subjects with and without dementia (N = 668, $r = 0.78$) and a study of patients with dementia (N = 93, $\kappa = 0.33$). Three other studies have demonstrated a significant relation between the MMSE score and the pathological quantitative measurements in

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the patients with AD. MMSE correlates ($r = 0.77$) with the synaptic density in frontal cortex tissue biopsies from the patients with AD ($N = 8$) and with the beta-amyloid deposits ($N = 20$, $r = 0.90$) in the cortex of the patients with AD. It is also significantly correlated with the synaptic density in the frontal cortex ($r = 0.728$), the inferior parietal cortex ($r = 0.645$) in the patients with AD.(4)

Another study demonstrated a significant relation between quantitative electroencephalogram and MMSE in the patients with AD ($N = 21$, $r = 0.623$).⁽⁹⁾

Neurological imaging in 63 patients evaluated with computed tomography positive images for atrophy or atrophy and focal abnormality, the MMSE score was low, which was not observed in the cases in which computed tomography (CT) imagery was negative.⁽⁴⁾

An MMSE score of 23 was suggested as an indicative cutoff for cognitive dysfunction. Having been followed 13 studies, the MMSE score with a cutoff 23 for dementia detection has a sensitivity of 63% and a specificity of 52-99%. In other studies that suggested a higher cutoff, between 25 and 27, it was found a sensitivity of 78-99% and a specificity of 70-87% in detecting dementia and cognitive disorder. In trials where the cutoff was lower (17 – 22), it has been reported a sensitivity of 52-98% and a specificity of 68 -100%.⁽⁴⁾

MMSE was negatively correlated with age in a series of follow-up studies, but it is known that aging increases the prevalence of Alzheimer's dementia and other dementias. MMSE also correlated with the level of education.⁽⁴⁾

MMSE in clinical practice

MMSE is a short and easy to perform instrument that has high relevance in detecting and tracking the progression of cognitive disorders associated to neurodegenerative diseases. MMSE is the most widely used test of mental status in the world. This test was translated into several languages and was used for cognitive screening in a series of epidemiological studies of dementia. The test is used in clinical practice and is reported in research studies.⁽⁴⁾

Using the MMSE test as a cognitive screening tool is demonstrated by its inclusion in the Diagnostic Interview Schedule (DIS), in the ACE study of the National Institute of Health and Heart and on the recommendations list for the diagnosis of Alzheimer's disease developed by the National Institute of Neurological and Communication Disorders and Stroke and the Alzheimer's Disease and Related Disorders Association (McKhann et al. 1984).⁽¹¹⁾

Since the MMSE test performance is influenced by the educational field and by age, some investigators recommend the correlation of the MMSE score with age and level of education, in staging cognitive performance and dementia detection. MMSE was found sensitive in following up the cognitive decline in the patients with Alzheimer's disease registering a decline of 1.8 to 3.2/year.⁽¹¹⁾ MMSE is effective in differentiating between types of dementia. Studies have reported differences between dementia within Alzheimer's disease and Huntington's disease, the patients' disorders profile being different.⁽⁴⁾

MMSE is the most commonly used and recommended test in cognitive screening. Its correlations with the clinical and laboratory parameters make it effective in stratifying cognitive impairment and dementia diagnosis.

The most common limitation of the MMSE score are the marginalization or the absence of certain cognitive abilities that occur with age during Alzheimer's disease or other dementias. Also, the limit determined by the educational level and age in the patients with cognitive impairment makes the MMSE test be a useful tool in observing cognitive

decline.^(4,5,11)

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