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Validity of the Montreal Cognitive Assessment Scale (MoCA) for the detection of cognitive impairment in schizophrenia

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Original article

ABSTRACT

Background

Schizophrenia is a severe mental disorder characterized by complex symptoms and impaired cognitive function, which has been considered a core feature. Research into cognition and schizophrenia over the past years has taken several different approaches including psychometric assessments.

Objective

The Montreal Cognitive Assessment (MoCA) has been proven useful in detecting cognitive impairment in patients with various forms of dementia. Our aim was to assess its validity as a screening instrument for cognitive impairment in schizophrenic patients.

Material and methods

One hundred patients diagnosed with schizophrenia were recruited at the Schizophrenia Clinic of the National Institute of Psychiatry in Mexico and assessed with the MoCA. For concurrent validity, the Mini Mental State Examination (MMSE) and the cognitive subscale of the Positive and Negative Syndrome Scale (PANSS) were used. Reliability was assessed through Cronbach's alfa.

Results

According to MMSE scores (with cut-off scores adjusted for education level), only 8% of the patients in our sample showed cognitive impairment in contrast with the total score obtained by 69% of the sample with cognitive impairment. The MoCA obtained a reliability measures (Cronbach's alpha=0.71), similar to the one reported by MMSE (α=0.70), showing appropriate concurrent validity.

Conclusions

The MoCA showed adequate psychometric properties for its use as a screening instrument for the detection of mild cognitive impairment (MCI) in patients with schizophrenia; filling a need for a brief and easy to use screening tool for MCI and schizophrenia in daily psychiatric clinical practice.

Key words: Mild cognitive impairment, schizophrenia, Montreal Cognitive Assessment Scale.

RESUMEN

Introducción

La esquizofrenia es un trastorno mental que posee múltiples dimensiones sintomáticas y las alteraciones cognitivas son características cardinales en la evolución del trastorno. El uso de clinimetría para evaluar dichas deficiencias puede aportar información en la investigación en este campo.

Objetivo

Determinar la validez y confiabilidad de la Escala de Evaluación Cognitiva Montreal (MoCA) para la evaluación del déficit cognitivo en pacientes con el diagnóstico de esquizofrenia.

Material y métodos

Se evaluaron cien pacientes con diagnóstico de esquizofrenia reclutados en la Clínica de Esquizofrenia del Instituto Nacional de Psiquiatría Ramón de la Fuente Muñiz. Se aplicaron las escalas de MoCA, MMSE y PANSS para la valoración de las funciones cognitivas. Se estableció la confiabilidad del MoCA con el Alfa de Cronbach y se estableció su validez concurrente con el MMSE y la subescala cognitiva de la PANSS.

Resultados

De acuerdo al MMSE (con ajuste de escolaridad) el 8% de los pacientes fueron clasificados con deterioro cognitivo en contraste con el puntaje total del MoCA que reporto 69% de la muestra con deterioro cognitivo. La escala MoCA obtuvo una confiabilidad (Alfa de Cronbach=0.71) similar a la observada por el MMSE (α=0.70) y adecuada validez concurrente.

Conclusiones

La MoCA es un instrumento confiable y válido para establecer la presencia de deterioro cognitivo leve en pacientes con esquizofrenia, sencillo y de fácil aplicación en la práctica clínica psiquiátrica cotidiana.

Palabras clave: Esquizofrenia, deterioro cognitivo leve, Escala de evaluación cognitiva de Montreal.

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BACKGROUND

Among psychiatric disorders, schizophrenia is characterized for being a condition with complex symptomatic dimensions. Its prognosis is poor due to the impairment of multiple cognitive functions, which handicaps the adequate social, academic or employment reintegration of the patient.[1,2] Cognitive impairment refers to the loss of cognitive functions, specifically memory, attention, and speed of information processing. Its onset and the changes it entails can be observed as a slow and gradual impairment that, in many cases, starts even before the first psychotic episode.[3-5] Additionally, it has been observed that such impairment develops throughout its clinical stages, during psychotic stages as much as during remission, despite treatment, and even before the appearance of psychotic symptoms.[6] The scope of cognitive deficit in schizophrenia is very broad and it has been reported that, when compared with standard performance of the general population,[5] patients with schizophrenia show multiple deficits in different areas such as attention, memory, language processing, executive functions, perception, motor skills and general intellectual functioning.[7]

Considering that cognitive impairment contributes to the social and employment maladjustment of patients, it is deemed necessary to address the subject of its assessment. The use of tests and scales can be helpful in clinical practice; therefore it is necessary to have clinical tests that are easy to administer, fast, reliable and validated.

The Mini Mental State Examination (MMSE) is a fast and easy to administer instrument that is widely used to examine cognitive impairment in patients with dementia.[8-11] On the other hand, the MMSE has been reported to be inadequate for the identification of incipient or complex cognitive impairment.[12-13] The Positive and Negative Syndrome Scale (PANSS) is used to assess the severity of schizophrenia symptoms, and has a factor to assess its cognitive dimension.[14] Validity studies on this scale have found correlations between its cognitive factor and performance in neuropsychological tests, concluding that the cognitive component of the PANSS can be a valid measurement of cognitive deficit in schizophrenia.[15-16] However, in spite of the estimation that the cognitive factor of the PANSS may provide useful information when a complete neuropsychological assessment is not possible in a daily clinical setting, validity studies show that its use is not recommended or adequate as a substitute of other clinical impairment assessments in schizophrenia.[17]

Other brief, easy to administer, instrument, that has shown adequate capacity for detective cognitive impairment is the Montreal Cognitive Assessment scale (MoCA). This instrument was developed to detect cognitive impairment in patients with a complex cognitive profile, such as mild cognitive impairment (determined when there is a decline in mental functioning, but criteria for dementia are not met), includes questions that require major cognitive stability in order to be classified as normal, specially in the area of executive functioning, and memory evocation.[13] This instrument has been widely used to detect mild cognitive impairment in patients with Alzheimer's and has been validated for various neuropsychiatric and cerebrovascular entities.[12,18-20] Furthermore, it has shown better sensitivity than the MMSE to detect cognitive impairment in geriatric patents and in patients with dementia. As for the use of the MoCA in schizophrenia, information regarding its validity is limited[21,22] and reported results need to be expanded.

Therefore, the aim of this study was to obtain data on the validity of the MoCA for the assessment of cognitive impairment in patients diagnosed with schizophrenia.

METHODS

Participants

Patients recruited were: male and female, aged between 18 and 45, who attended the Schizophrenia Clinic at the National Institute of Psychiatry Ramón de la Fuente Muñiz, with a previously-established clinical diagnosis of any type of schizophrenia, according to DSM-IV-TR criteria,[23] with less than ten years of evolution since diagnosis establishment, without current acute episode of psychosis (60-120 score in PANSS) that might impede administration of measuring instruments at time of assessment. All patients who showed current co-occurring mood disorders, psychotic disorders due to a medical condition or induced by substance use or abuse were excluded from participation.

A cross-sectional assessment was conducted, which included the data collection of socio-demographics and clinical data of the condition with a form designed for this purpose by means of a direct interview with the patient and his/her family.

This study was approved by the Research and Ethics on Research Committees of the National Institute of Psychiatry Ramón de la Fuente Muñiz. Subject participation was voluntary, study information was provided through an informed consent process, and participant identification data was kept under confidentiality.

Description of assessment scales and instruments

Mini Mental State Examination scale (*MMSE*). The MMSE is the most widely used scale to assess cognitive impairment.[8] Maximum score is a total of 30 points, and items are grouped in five sections that assess orientation, immediate memory, attention and calculation, recall, and language and construction. Cut-off score for cognitive impairment is usually established at 24 points. If a score needs to be nulled (due to

illiteracy, blindness, hemiplegia, etc.), a new, proportional score is calculated using an adjustment table that gives reference data according to age and education level, which can serve to compare patient results.[9] Validation studies on patients with Alzheimer's demonstrate that this scale has good sensitivity (87%-100%) and specificity (62%-100%) to detect cognitive impairment.[9-11]

Positive and Negative Syndrome Scale (*PANSS*). This instrument is specifically for assessing three primary areas in schizophrenia: positive and negative syndromes and general psychology, from a dimensional point of view.[24] Recent studies have shown evidence supporting five areas of symptomatology (positive, negative, cognitive, anxiety/depression and excitation).[25] This pentagonal model has been validated for Mexican patients with schizophrenia, allowing the elucidation of diverse clinical aspects of this condition.[26]

Montreal Cognitive Assessment scale (*MoCA*). This test assesses executive and visuospatial function, identification, memory, attention, language, abstraction, recall and orientation. Its application time is five to ten minutes, and it has been translated into ten languages. The specificity of the MoCA to exclude normal controls is good, at 87%; while its sensitivity is considered excellent, at 90%, to detect mild cognitive impairment, and considerably more sensitive than the MMSE.[12,13] Cut-off score to determine cognitive impairment is >26 points.

Statistical analysis

Descriptive analysis of clinical and demographic characteristics was carried out with frequencies and percentages for the categorical variables, and means and standard deviations for the continuous variables. To determine concurrent validity, a linear association was determined using Pearson's coefficient of correlation between the total scores of the MoCA and the MMSE and the PANSS cognitive subscale score. Reliability of the MoCA was assessed through Cronbach's alpha in order to obtain its internal consistency. Statistical significance was established at a p value of <0.05.

RESULTS

Demographic characteristics of the sample

A total of 100 patients diagnosed with schizophrenia were included for participation, which consecutively attended the Schizophrenia Clinic service at the National Institute of Psychiatry Ramón de la Fuente Muñiz.

Of the patients included, 65% were men and 35% were woman, with a mean age of 34.1 ± 8.7 years (range 18-53 years) and an education level of 11.7 ± 3.1 years (range four to 20 years), which is equivalent to the second year of high school. Regarding civil status, 83% of the sample was single at the time of study participation, 14% was married, and the remaining 3% was separated or divorced. Regarding socio-economical status, 54% reported being low-income, followed by 45% who were middle-income and one per cent (1%) was in the high-income level. Of the total sample, 43% were unemployed, 25% worked at home, 9% were students and 23% were paid employees.

Clinical characteristics of the sample

Ninety-three per cent (93%) of the patients were diagnosed with paranoid schizophrenia, with a patient-reported onset age of 23.6 ± 7.4, with a mean duration of untreated psychosis (DUP) of 139.5 ± 146.3 (median = 104 weeks), equivalent to more than two years with frank symptoms of psychosis without receiving specialized treatment. Forty-eight per cent (48%) of the patients reported having been hospitalized at some point during study participation, with a mean of 1.9 ± 1.7 psychiatric admissions (range 1-8 admissions) and a mean duration of stay of 8.9 ± 9.6 weeks (range 1-52 weeks), with a mean age of first admission of 25.9 ± 7.7 (range 15-50 years).

Psychopathology spectrum of patients with schizophrenic patients included in the study was assessed with the five-factor PANSS. The mean scores of the PANSS, as well as the mean scores of the MoCA and MMSE scales are showed in Table 1.

Cognitive impairment

According to the MMSE score adjusted for patient education level, only 8% of the sample was classified as having cognitive impairment. Regarding the MoCA scores, using the cut-off score (26 points) proposed by its authors, and after adjusting the scores for level of education (by adding one point to the overall score when the patient education level was <12 years).

Table 1. Symptomatic severity and cognitive assessment of the sample

Variable	Mean	Standard deviation
Symptomatic severity (PANSS)		
• PANSS positive	19.2	5.6
• PANSS negative	22.6	5.7
• PANSS cognitive	18.3	5.4
• PANSS excitation	5.8	2.3
• PANSS depression/anxiety	9.6	4.0
• PANSS total	75.7	15.9
Cognitive assessment		
• MoCa total	23.0	3.9
• MMSE total	27.6	2.5

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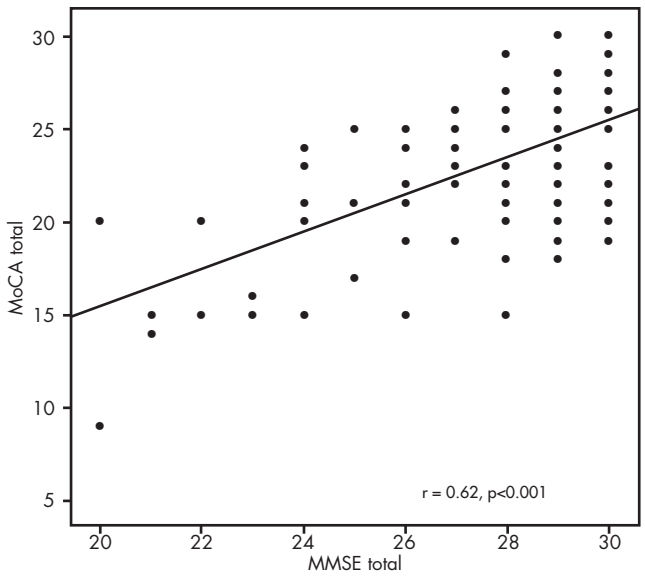

Figure 1. Correlation between the total scores of the MoCA and the MMSE.

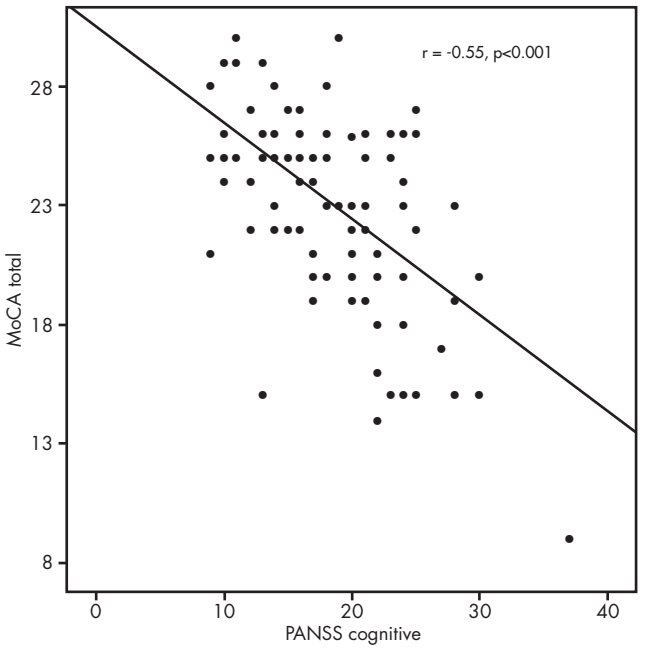

Figure 2. Correlation between the total score of the MoCA and the cognitive subscale of the PANSS.

Reliability and concurrent validity of the MoCA in patients with schizophrenia

The MoCA obtained a Cronbach's alpha of 0.71, which is considered indicative of moderate reliability, and similar to the reliability measure obtained by the MMSE (α=0.70). High correlations were found (r=0.62, p<0.001) between the total scores of the MoCA and the MMSE (Figure 1), as well as between the MoCA and the cognition subscale of the PANSS (Figure 2); which is indicative of adequate concurrent validity of the MoCA for the assessment of cognitive impairment.

DISCUSSION

It has been described that the cognitive functions of patients with schizophrenia are affected throughout the duration of the illness. The search for evaluating factors of changes in cognitive function remains a premise in their clinical research. Various reports have described the close relationship between cognitive function and social deficit in schizophrenia. These function deficits limit their performance in all other areas of life, while there is growing evidence of social cognition in schizophrenia being related with marked social dysfunctions in the patient, even after controlling performance in neurocognitive tasks.[27]

By review of our sample demographics, it was observed that the majority of the patients were not involved in a couple relationship, which is consistent with other reports that described an important correlation between number and quality of real-social relationships and cognitive state. Throughout various studies,[28] all fundamental neurocognitive constructs (mainly immediate and secondary memory and executive functions) have shown significant correlations with results in social functioning. More than half of the sample did not have paid employment at the time of the study; neurocognitive deficits are also correlated with deficits in the execution of specific skills critical to lead an independent and productive life.[29] Some studies, which assess the relationship between cognitive function and employment status, have considered cognitive deficit a core characteristic of the disorder that affects from the restriction of social relationships to a reduced likelihood of having and keeping a job. The DUP found in our study was lower than that reported in other samples.[30] There is great variability surrounding this phenomenon, given that some patients may seek and receive treatment, weeks or months after the onset of first psychotic symptoms, while others remain untreated for years.

The aim of this study was to obtain data on the reliability and validity of the MoCA in a group of patients with schizophrenia. The observed cognitive deficit profile in the sample was broadly heterogeneous when using both the MMSE and the MoCA. When assessing the sample with both instruments, a lower average score was reported with the MoCA scale than with the MMSE, adjusting both scores for education level. More cases of mild cognitive impairment were detected when using the MoCA than when using the MMSE. It would seem that the MoCA has more sensitivity in the detection of cognitive impairment than the MMSE.

Some authors have defined cognitive impairment as any subjective complain of memory loss that can also be recognized by a family member; but its detection is compli-

cated in patients whose general cognitive function and daily life activities remain intact and whose scores in neuropsychological tests are 1.5 standard deviations below the mean, adjusted for age and education.[31] Because of this, the differences found in the number of patients in this sample with cognitive impairment detected by the MoCA and the MMSE may be explained by the MMSE being an instrument that screens for mayor cognitive alterations, while the MoCA has the capacity to identify variations in cognitive functioning that do not affect patient functioning and is also capable to detect impairment in its early or incipient stages of development. Additionally, specifically in schizophrenia, other variables could be involved indirectly in the observed cognitive impairment, such as the low premorbid intelligence quotient (IQ) associated with schizophrenia.[32]

As a cognitive assessment screening instrument, the MoCA showed adequate concurrent validity when compared with the scores obtained with the MMSE and with the global severity observed in the PANSS cognitive symptomatology assessment; which is consistent with what has been reported in other studies.[33-35] The severity of the syndromic framework in patients is not stable over time; therefore, even when an adequate concurrent validity is observed between the MoCA and the PANSS cognitive subscale, it is necessary to determine if the former, like the PANSS, is sensitive to the cognitive changes observed over the course of the condition.

Nevertheless, the internal consistency of the MoCA resulted with a Cronbach's alpha of 0.70, which indicated that the scale has a moderate reliability for the detection of cognitive impairment in patients with schizophrenia. Even though a scale is considered reliable when it has an alpha over 0.80, it is timely to note that there are no published results on the validity and reliability of the MoCA with the Mexican general population, and that future studies are needed that assess its internal consistency taking into account the aforementioned confounding variables and allow better estimation of the adequateness of the MoCA as a screening tool for cognitive impairment in schizophrenia.

Overall, and in spite of the aforementioned limitations regarding the difficult assessment of cognitive impairment in patients with schizophrenia, study results show that the MoCA can be an effective tool for the screening of cognitive impairment in patients with schizophrenia and that, given the case that its clinimetric properties are replicated and even improved upon in future studies, it will allow a better understanding of this key factor associated with the condition. In this way, there will be a brief validated tool that will allow a clinician to include cognitive rehabilitation strategies within the treatment plan of the patient with schizophrenia.

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