



A pilot study to measure cognitive impairment in patients with severe schizophrenia with the Montreal Cognitive Assessment (MoCA)



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ARTICLE INFO

Article history:

Received 28 March 2014

Received in revised form 30 June 2014

Accepted 3 July 2014

Available online 1 August 2014

Keywords:

Schizophrenia

Cognitive impairment

Cognitive assessment

Montreal Cognitive Assessment (MoCA)

ABSTRACT

Cognitive impairment has been suggested to be a core feature of a schizophrenia diagnosis. Many comprehensive neuropsychological batteries and experimental procedures have been used to assess cognitive impairment in schizophrenia. A few brief performance-based cognitive assessments have been developed to fulfill the need of a more feasible cognitive assessment for schizophrenia in clinical settings. However, their usability is in question. The Montreal Cognitive Assessment (MoCA), a brief cognitive assessment tool, has been used widely in different clinical settings because of its high sensitivity and specificity for detecting cognitive impairments. This study assessed cognitive function in patients with schizophrenia by using the MoCA tool. The results showed that the MoCA was sensitive enough to detect cognitive impairment in patients with schizophrenia. It also provided normative data for the MoCA in schizophrenia patients. Furthermore, the results revealed that cognitive impairment measured by the MoCA was correlated with their education level, severity of illness, and negative symptoms. Lastly, the MoCA total score could be a significant predictor of patients' length of stay in the facility.

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1. Introduction

Cognitive impairment has been recognized to be a core feature of a schizophrenia diagnosis (Elvevag and Goldberg, 2000; O'Carroll, 2000; Wilk et al., 2005). A wide range of cognitive functions, including attention/vigilance, visual feature processing, working memory, speed of processing, learning, motor skills, executive function, language, spatial ability, intelligence, and social cognition, have been found to be impaired in patients with schizophrenia. A considerable amount of evidence demonstrates that cognitive impairment often presents before the onset of the illness and is relatively stable across psychotic state changes and time (Heinrichs and Zakzanis, 1998; Pietrzak et al., 2009; Rund, 1998; Sharma and Antonova, 2003). Many studies have revealed associations between cognitive deficits and functional outcomes such as occupational outcome and independent living (Green et al., 2000, 2004; Green, 2006). The importance of assessing cognitive impairment in schizophrenia is well recognized. Many comprehensive neuropsychological batteries have been used to assess cognitive impairment in schizophrenia. Typically those assessments are time consuming

(take hours to days to complete) and require a licensed neuropsychologist to administer, score, and interpret. Applying comprehensive neuropsychological tests is not usually probable in routine clinical practice. A brief yet effective cognitive assessment tool that does not require a neuropsychologist to interpret would be more practical for most clinical settings.

A few short performance-based cognitive assessments, for example, the Brief Assessment of Cognition in Schizophrenia (BACS), the Brief Cognitive Assessment (BCA), and the Brief Cognitive Assessment Tool for Schizophrenia (B-CATS), have been developed to evaluate the general cognitive function in schizophrenia (Gold et al., 1999; Hurford et al., 2011; Keefe et al., 2004; Velligan et al., 2004). Nonetheless, the clinical usage, reliability or validity is not well established. There are a few publications to validate the BACS in other languages such as French and Japanese, however, the use of the three assessments in clinical settings were barely reported. The highest correlation between BACS composite score and standard battery domains was .76 for patients. The test–retest reliability of test items ranged from .12 to .93, with the composite score ranging from .86 to .92 for the patient group. The BCA includes three existing neuropsychological tests: verbal fluency (letters and categories), trails A and B, and the Hopkins verbal learning test. The test–retest reliability was .84, based on the data from a subsample. The validity was .72. The B-CATS was constructed mainly for its brevity. It also consists of three existing neuropsychological tests, i.e. the trail making test B, digital symbol, and category fluency. The correlations of the B-CATS with the larger battery total scores were based on evaluating

Abbreviations: ANOVA, analysis of variance; CGI, Clinical Global Impression scale; MCI, mild cognitive impairment; MoCA, the Montreal Cognitive Assessment; PANSS, Positive and Negative Symptom Scale; SPSS, Statistical Package for the Social Sciences.

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data from three previous published trials for other research purposes. The validity was reported as .73 to .86 for different trials, with reliability ranging from .84 to .94. In addition, the BACS needs about 35 min to administer and some extra time to score, which is tiresome to patients and clinicians. The BCA and B-CATS require shorter administration time (about 12 to 15 min). However, both assessments are basically a selection of a small number of standardized neuropsychological tests. The scores are item/cognitive domain based and need to be converted into z-scores according to the existing appropriate normative sample. No direct total score or cut-off score are available for a quick and easy assessment of the general cognitive function/impairment in schizophrenia. Furthermore, the neuropsychological tests are copyrighted and forms need to be purchased so there are costs involved when using the BCA and B-CATS, which further limit their usability in clinical settings.

The Montreal Cognitive Assessment (MoCA), a recently developed brief cognitive screening instrument, has been used in different clinical settings because of its high sensitivity and specificity for detecting cognitive impairments (Nasreddine et al., 2005; Popović et al., 2007; Copersino et al., 2009; Luis et al., 2009). With a test-retest reliability of .92 and validity to MMSE of .87, a considerable body of research shows that the MoCA seems to be superior to the Mini-Mental State Examination (MMSE), which is one of the gold-standard cognitive assessments in dementia, in detecting mild cognitive impairment (Popović et al., 2007; Hoops et al., 2009; Pendlebury et al., 2010). The main difference between the MoCA and MMSE is that the MoCA also includes tasks assessing executive function and abstraction. It reduces weight on orientation to time and place while adding weight on recall, attention, and calculation. Specifically, the MoCA assesses the following cognitive domains. The visual spatial abilities are assessed with a clock-drawing task (3 points) and a three-dimensional cube copy (1 point). Executive functions are evaluated using an alteration task adapted from the Trail Making B task (1 point), a phonemic fluency task (1 point), and a two-item verbal abstraction task (2 points). The short-term memory recall task (5 points) includes two learning trials of five nouns and delayed recall after approximately 5 min. The attention, concentration, and working memory are assessed with a target detection using taping task (1 point), a serial subtraction task (3 points), and digits forward and backward tasks (2 points). The language task involves a confrontation animal naming task (3 points), repetition of two syntactically complex sentences (2 points), and abovementioned fluency task. Lastly, orientation to time (date, month, year, and day) and place (names of the place and city) is evaluated (6 points). All those cognitive domains are also known to be impaired in schizophrenia. The MoCA can be administered within 10 min and the total possible score is 30 points. It has a cut-off score of 26 to distinguish patients with mild cognitive impairment (MCI) from patients with intact cognition or normal adults. Furthermore, it has been translated into 36 languages and used in over 100 countries. It is free of charge to patients. It appears to be an ideal candidate for a short, efficient, and effective cognitive assessment tool for patients with schizophrenia.

Besides patients with dementia and Alzheimer's disease, normative data has been established in different clinical and non-clinical populations such as patients with cerebrovascular disease and post-stroke, patients with MCI, patients with known or suspected brain pathology, and healthy adults stratified by age, education, and ethnicity (Bernstein et al., 2011; Rosserti et al., 2011). The main objectives of this study were to provide preliminary normative data for the MoCA in schizophrenia patients, to assess its feasibility in detecting cognitive impairment in patients with schizophrenia, and to identify the cognitive domains that were impeded in patients with schizophrenia.

Furthermore, the relevance of cognitive impairment to psychopathological symptoms has attracted extensive attention in schizophrenia research. However, the results are mixed (Addington et al., 1991; Carter et al., 1996). This study examined whether the cognitive impairment measured by the MoCA associated with patients' demographic

characters, i.e., age, gender, and education, psychopathology features, i.e., symptoms measured by the Positive and Negative Symptom Scale (PANSS) and severity of illness measured by the Clinical Global Impression scale (CGI). In addition, a considerable amount of evidence has found some cognitive deficits are predictors of functional outcome such as employment and independent living (Sharma and Antonova, 2003; Keefe and Harvey, 2012). In this study, we investigated whether cognitive deficit measured by the MoCA correlated to the length of stay in hospital/facility, a commonly employed outcome measure in health care service, to probe whether cognitive impairment could be a predictor of length of stay.

2. Methods

2.1. Clinical setting

Hillside Centre is a tertiary mental health facility, located in Kamloops, British Columbia, Canada. It has three programs with 47 beds: 25 beds in Neuropsychiatry, 11 beds in Geriatric Psychiatry, and 11 beds in a general adult psychiatry program. This centre mainly provides mental health services to patients with acute illness and/or severely dysfunctional behaviors who cannot be cared for in the secondary or general hospital psychiatric system within the Interior Health Authority and Northern Health Authority of British Columbia. Lengths of stay are prolonged due to the refractory nature of many patients' illnesses.

At this centre, patients admitted into the general adult psychiatry program are assessed with a variety of psychiatric measurements at admission and discharge to evaluate their symptom severity, psychiatric symptoms, and cognitive impairments. The assessments include CGI, PANSS, and MoCA. The CGI and PANSS are completed by their psychiatrist. The MoCA is administered by a clinician, who is trained by a registered neuropsychologist to administer the MoCA. On average, there are about 80 admissions in the adult program each year.

2.2. Design and participants

A retrospective data review of medical records of patients admitted to Hillside Centre from October 1, 2008 to December 31, 2012, was conducted. The retrospective data review identified 121 patients whose primary diagnoses was schizophrenia or schizoaffective disorder according to Diagnostic and Statistical Manual of Mental Disorder (DSM IV) criteria and who had completed the MoCA assessment. The data review also included their demographic information, as well as the scores from the CGI and PANSS, including its sub-scale scores, at admission. In addition, length of stay in days of each patient at the facility was also obtained.

2.3. Statistical analysis

Data analyses were conducted using SPSS version 17. The mean and standard deviation (SD) were reported for each MoCA item. Descriptive statistics of patient demographic and clinical characteristics assessed by CGI and PANSS were also presented. In addition, Pearson correlations were employed to investigate relationships between MoCA performance and demographic variables (i.e., age, gender, education), illness severity (i.e., CGI score), positive and negative symptoms (i.e., PANSS scores), and length of stay (in days) in the facility.

3. Results

3.1. Demographic, cognitive, and clinical features

The demographic characteristics, i.e., age, gender, education, general cognitive function, i.e., the CGI score, and clinical features, i.e., the PANSS total and subtest scores, as well as the length of stay, are shown in

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