EXPLORING THE APPROPRIATENESS OF THE MONTREAL COGNITIVE ASSESSMENT AS A CULTURALLY SENSITIVE SCREENING TEST IN THE SESOTHO-SPEAKING POPULATION

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A mini-dissertation submitted to the Faculty of Health Sciences, University of the Free State, Bloemfontein, in partial fulfilment of the requirements for the degree Master of Medicine in Psychiatry

Bloemfontein, South Africa

April 2020

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DECLARATION

I, Jan Konig Mienie, declare that this research report represents my own independent work. It is being submitted for the degree Master of Medicine in Psychiatry at the University of the Free State. It has not been submitted before for any degree or examination at any other university, neither has any part of it been published before.

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April 2020

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ACKNOWLEDGMENTS

I would like to express my sincere appreciation to the following people:

- Dr. Carla Nel, my supervisor and Dr. Francois Potgieter for their expertise, patience and guidance throughout the whole research process from protocol to the final manuscript.
- Lerato Makhele for assistance with the interpretation of the information letter and questionnaires to Sesotho.
- Cornel van Rooyen, Department of Biostatistics, Faculty of Health Sciences, UFS for his assistance with the processing of data.

DEDICATION

I dedicate this manuscript and research to my partner, Lance Bailie. Without his love, patience and support it would not have been possible.

LIST OF ABBREVIATIONS

DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, 4th edition
DSM-5	Diagnostic and Statistical Manual of Mental Disorders, 5th edition
HAND	HIV-associated neurocognitive disorder
MoCA	Montreal Cognitive Assessment
NCD	Neurocognitive disorder, commonly referred to as dementia

SUMMARY

Neurocognitive disorder (NCD) or dementia, is a progressive neurodegenerative syndrome that causes severe impairment in function. The disease burden of NCD is increasing in middle- and low-income countries as life expectancy increases. Early detection and intervention is essential in the management of NCD. In countries with severe resource constraints, low-cost screening tools to diagnose cognitive impairment is imperative, as extensive neurocognitive batteries are rarely feasible. The Montreal Cognitive Assessment (MoCA) is one of these screening tools designed for the diagnosis of mild cognitive impairment. Limited information on the validity of the MoCA in a South African population is available, as it was initially validated for English- and French-speaking populations.

We conducted a descriptive study that explored the appropriateness of the MoCA in screening for cognitive impairment in a Sesotho-speaking population. The study was conducted in Bloemfontein in the Free State Province, South Africa. Participants were recruited from National District Hospital and Pelonomi Academic Hospital.

Ninety-three Sesotho-speaking healthcare users between 18 and 62 years of age were recruited. All participants were screened for mental and other illnesses that could impair cognitive function prior to the administration of the MoCA.

Using the normed MoCA cut-off score of 26. The MoCA yielded a false positive screen with a total score of 25 or less in 63 (67.7%) of the participants. Although participants with a tertiary level of education did perform better than the participants with lower educational attainment, their mean total score of 23.9 was still below the recommended cut-off score.

Significant concerns regarding cultural bias in the MoCA emerged in the sample, regardless of the level of education of participants. This might indicate that some items may not be culturally appropriate for the Sesotho-speaking population and might lead to false positive screening for cognitive impairment. Future research should focus on collecting normative data in the population in an attempt to suggest more appropriate substitutes for these items.

Keywords: screening tests for dementia; neurocognitive disorder; Montreal Cognitive Assessment; MoCA; cognitive assessment in South Africa

CHAPTER 1

LITERATURE REVIEW

1. Review of the literature

1.1 Definition of neurocognitive disorder (NCD)

The category on neurocognitive disorder (NCD) in the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5)[1] includes disorders in which the primary deficit lies in cognitive function. Cognition is defined as the process of obtaining, organising and using intellectual information. Although other mental disorders may present with cognitive impairment, the NCD category is limited to disorders in which a cognitive deficit is the core feature and represents a notable decline in previous level of functioning. The NCD diagnostic category represents non-communicable syndromes of a progressive nature caused by neurodegeneration affecting a range of cognitive domains. Six defined cognitive domains, namely complex attention, executive function, learning and memory, language, perceptual motor and social cognition, can be affected to varying degrees in NCD. These functional domains are affected differently by the different aetiological subtypes of NCD.[1,2]

In the DSM-IV, NCDs were referred to as dementia, delirium, amnestic disorder and other cognitive disorders. The DSM-5 classification of NCDs primarily involves division into either mild or major neurocognitive disorder. The term dementia has been retained in the DSM-5 and is often used for major neurocognitive disorder.[1]

1.2 Aetiology of NCD

The aetiology of NCD is often known and reflected in the DSM-5 diagnostic formulation. The aetiological subtypes of NCD include: NCD due to Alzheimer's disease; frontotemporal NCD; NCD with Lewy bodies; NCD due to Parkinson's disease; NCD due to traumatic brain injury; NCD due to HIV; substance or medication-induced NCD; NCD due to Huntington's disease; NCD due to prion disease; NCD due to another medical condition; NCD due to multiple aetiologies; and unspecified NCD.[1,2]

1.3 Burden of NCD

NCD is becoming a growing economic burden worldwide with approximately 44 million people affected, of which 60% are living in low- to middle-income countries.[3] Closely similar, the World Alzheimer Report of 2016[4] estimated that 46.8 million people are living with dementia worldwide, of which 58% are estimated to be living in low- or middle-income countries. The proportion of people who live with dementia in low income countries are also predicted to increase by 264% from 2015 to 2050. This number is substantially higher than the predicted increase of 116% in high income countries. The increase in NCD can partially be ascribed to an increase in life expectancy, together with a growing epidemic of chronic non-communicable diseases in poorer countries.[4] The total estimated worldwide cost related to NCD was 604 billion US dollar (USD) in 2010, which has increased to USD818 billion in 2015.[4]

NCD is associated with an intense need for health- and physical care, which is labour- and resource-intensive. In the UK, it is estimated that the cost of dementia healthcare is almost equivalent to the combined cost of cancer, heart disease and stroke care.[4] Factors contributing to the economic burden of NCD include the need for a full-time caretaker. A study conducted in Cape Town found that 79% of patients attending memory clinics were taken care of by family members, some of whom had to give up their job to do so.[5] Thus, a diagnosis of NCD does not only affect the individual with the disease, but also family members and friends, which in turn has economic effects on the wider society.

1.4 NCD in the South African context

Little is known about the prevalence and impact of NCD in South Africa and the need for studies are crucial. Research conducted at the University of the Free State found that the prevalence of NCD was approximately 6% in a sample of 200 urban black persons.[6] A younger age of onset of NCD is also more common in South Africa because of the high burden of HIV.[7]

The disease burden of NCD in South Africa is expected to increase. One factor contributing to this probability is the anticipated increase in the proportion of South Africans above the age of 60 years to 11% of the population by 2030. An increasing number of older adults are also

affected by conditions associated with neurodegeneration, such as traumatic brain injury, alcohol dependence and HIV infection.[8]

1.5 HIV as the aetiology of NCD in the South African context

NCD in South Africa is a potentially growing epidemic secondary to HIV. In untreated HIV patients with late stage disease, the prevalence of HIV-associated NCD (HAND) ranges between 15% and 30%,[9] with these patients presenting with neurocognitive impairments, emotional disturbances and motor dysfunction. The prevalence of less severe forms of HAND is 20–30% in patients on antiretroviral therapy.[9]

The early detection of mild cognitive impairment is essential for several pharmacological and non-pharmacological interventions. Early diagnosis allows the treatment of reversible causes of cognitive impairment, the modification and treatment of vascular risk factors and implementation of non-pharmacological measures, such as exercise and cognitive rehabilitation[1]. The timely identification of cognitive disorders in patients with HIV is of particular importance to clinical practice, because of the association with poor adherence to highly active antiretroviral therapy (HAART), faster disease progression and higher mortality.[10,11]

1.6 NCD diagnosis and assessment screening

The gold standard for the evaluation of cognitive impairment is to administer an extensive neuropsychological assessment. These neuropsychological assessments are often not feasible in a primary healthcare setting, because they are labour-intensive, time-consuming and require expert training to be administered. For this reason, brief screening tools for cognitive impairment have been developed.[12,13]

Screening instruments for cognitive impairment usually consists of systematic, structured questions and tasks, and should not be dependent on co-lateral information to complete. It usually takes less than 10 minutes to administer. Personnel administering the screening test should not take more than a few hours of expert training to master correct administration procedures. In the South African setting, screening tools have become essential to aid practitioners in the identification of possible cognitive impairment, as neuropsychologists and

other diagnostic modalities, such as magnetic resonance imaging (MRI) scans, are often not available in public healthcare settings.

Ideally, screening test should be specific and sensitive to both mild NCD and more severe forms of the disease. To maintain validity, screening instruments should not be influenced by a patient's language, cultural background or level of education.[14]

One of the screening tools often used in routine practice is the Montreal Cognitive Assessment (MoCA).[15] The MoCA was developed to assist physicians and other health professionals to detect mild cognitive impairment in a primary setting. The MoCA, which takes 10 minutes to administer, consists of 13 tasks measuring the following cognitive domains: visuospatial/executive function, naming, memory, attention, language, abstraction, delayed recall, and orientation. The maximum obtainable score is 30, with a cut-off score of 26 or less proposed as an indication of cognitive impairment. As reported by Nasreddine,[15] the MoCA has a sensitivity of 90% and a specificity of 87% for detecting mild neurocognitive impairment in patients, compared to the Folstein Mini-Mental State Examination (MMSE) that has a sensitivity of 18% in the detection of mild cognitive impairment. Therefore, patients with mild neurocognitive impairment are at greater risk of performing within a normal range when evaluated with the MMSE, compared to the MoCA. The MoCA was originally developed for use in a North American population of adults at risk of developing Alzheimer's disease, but has since been studied and validated in several countries, including Korea, Japan, Egypt and Portugal.[16,17]

South Africa is in great need of culturally impartial screening tests for NCD. South Africa has a very diverse population with 11 national languages and multiple ethnic groups. Wide variations in socioeconomic and educational background are prevalent in the South African population. Only 20% of South Africans have completed Grade 12 and nearly 33% of the population are functionally illiterate.[18] These factors complicate the development of screening tests for NCD that are free of educational or cultural bias. Neuropsychological test batteries also have prominent issues with these forms of bias. Most of the test batteries available may not be applicable to uneducated individuals or individuals from cultures in which these batteries have not been standardised and validated.

Cross-cultural issues of bias concerning psychometric tests became a concern in South Africa as early as the 1920's. These psychometric assessments were mostly imported from developed countries, starting in the 1900's.[19] After 1994, the need for culturally fair screening tests was emphasised as demonstrated by the Employment Equity Act 55 of 1998, Section 8,[20] which states: "Psychological testing and other similar assessments are prohibited unless the test or assessment being used (a) has been scientifically shown to be valid and reliable, (b) can be applied fairly to all employees; and (c) is not biased against any employee or group."

The development of cognitive screening tests is not a simple task. Nevertheless, it is essential for detecting cognitive impairment in a primary care setting. Most studies on brief screening instruments illustrated the occurrence of higher false positive rates of cognitive impairment in patients with a lower level of education, and also persons from sociocultural groups for which the screening tests were not originally standardised. Often these screening tools are susceptible to cultural bias.[14] In South Africa, with its culturally and linguistically diverse population, the concept of bias in cognitive assessment is crucial. In statistics, bias refers to a systematic error in the estimation of a value. A biased cognitive assessment is one that systematically overestimates or underestimates the value of the variable it is intended to assess.

Van de Vijver and Tanzer[21] proposed three types of bias, namely construct bias, method bias and item bias. Construct bias occurs when the construct measured is different across cultures or when there is a cross-cultural difference in behaviours associated with the construct. This often happens when there is a partial overlap of definitions of a construct in different cultures. Method bias refers to bias related to the method in which a study is conducted. Three types of method bias can be differentiated, the first being sample bias, where samples are not matched appropriately and are thus incomparable. The second form of method bias is instrument bias, where intrinsic features of the assessment used causes bias. The third method bias is administration bias, referring to the administrator of the assessment, where an assessment is not administered appropriately. The last form of bias is referred to as item bias, which occurs in assessment when items are inappropriate or unfamiliar to a certain cultural group. Item bias often occurs as a result of inadequate translation of items in a set test.[21]

A multitude of linguistic, cultural and psychological considerations need to be taken into account when adapting a test for a specific population. Translation of cognitive assessments involves specific techniques. The first procedure that needs to be followed is known as the

translation-backtranslation procedure. A text is first translated into a desired language, followed by a different translator then translating the text back to the source language. The quality of translation is evaluated by comparing the original with the back-translated version of the text for accuracy. However, a cognitive test that has been translated with good linguistic accuracy may still not be culturally fair. For this reason, a second procedure, known as the committee approach, has to be followed with the interpreted text. A group of people with different expertise evaluates the interpreted text for quality and appropriateness. Depending on the translated text or assessment, the committee can consist of experts in psychology, linguistics and culture, as well as members of the community.[21] Translating a cognitive assessment into a desired language, however, does not ascertain the validity of the test for use in a given population.

Most diagnostic screening tools for NCD are developed in high income settings and are biased by educational attainment. These tests often do not have established cross-cultural validity. Internationally, the need for developing culturally fair screening tools for neurocognitive disorder is well recognised. Organisations such as the 10/66 Dementia Research group, promote research regarding NCD in middle- to low-income countries to help redress the imbalance in dementia research between higher and lower income settings.[3]

Results from screening tools for NCD can only be interpreted with confidence if they resulted from standardised procedures that are culturally sensitive. In a primary healthcare setting, we rely heavily on cognitive screening tools to diagnose or exclude NCD. In developing countries, low levels of education, limited literacy and numeracy, and other culture-related issues may result in cognitively unimpaired people screening positive for NCD.[9]

In South Africa, the English version of the MoCA is currently widely used in different treatment settings. However, limited research is available regarding its validity for local use in different population groups. In a study by Robbins et al.,[9] the use of the MoCA as a screening tool for HAND was investigated. The study was conducted on 78 isiXhosa-speaking participants in the Western Cape, and included 38 HIV-positive patients and a control group of 38 HIV-negative, healthy individuals. Floor effects were observed in complex drawing tasks, rhinoceros naming, serial 7's and abstraction in both the HIV-positive patients and the control group. The mean total score in the healthy control group was below 23, which is well below the established cut-off score for NCD. The healthy control group would therefore be classified

as impaired, compared to the MoCA normative sample means and standard deviations. Based on their results, Robbins et al. suggested that the MoCA might be wholly inappropriate for the South African population, as it may lead to misclassification of healthy individuals as cognitively impaired.[9] In a similar study Ganasen et al.,[22] concern was raised that items in the HIV Dementia scale, such as complex drawing tasks, mighty not be culturally fair in some South African populations.

Without culturally fair screening tools, not only can we not confidently assess for NCD in patients, but we cannot comment on the prevalence and incidence of NCD in the South African population.

2. Research question

We investigated the appropriateness of the MoCA as a screening test for NCD in the Sesotho-speaking population by exploring the test's performance in the clinical setting with a Sesotho-speaking sample at low risk for developing neurocognitive impairment. Specifically, the research question entailed whether the administration of the currently used English version of the MoCA yields false positive screens when administered to Sesotho-speaking healthcare users.

3. Research aims and objectives

3.1 Aim of the study

This study aimed to continue with the investigation initiated by Robbins et al. in 2013,[9] whose findings questioned the validity of multiple tasks in the MoCA for an isiXhosa-speaking population. Informed by their findings, the appropriateness of the use of the MoCA as a screening test in a sample of Sesotho-speaking healthcare users at low risk of having NCD, was evaluated by investigating if the MoCA yielded false positive screening results. Due to the lack of normative data and research on the validity of screening tests for NCD in a South African population, it is envisioned that this study would be able to give a preliminary indication of whether the MoCA could be considered a suitable screening test in a local population.

3.2 Specific objectives

- To administer the MoCA screening test on Sesotho-speaking participants at low risk of cognitive impairment.
- To compare results to standardised cut-off scores validated for a North American population.
- To explore the influence of the level of education on the overall performance of the sample.
- To identify which items, if any, might not be appropriate for this population group.

4. Hypothesis

In a culturally diverse country such ase South Africa, cultural and educational bias might affect the results of cognitive batteries and screening tests. As reported by Robbins et al.,[9] floor effects were found with several items in the MoCA that was administered to an isiXhosa sample. These floor effects might suggest that selective items in the MoCA might not be appropriate. In this study we hypothesise that the MoCA in its current English form might similarly not be appropriate to screen Sesotho-speakers, as this might lead to a false positive screen for mild cognitive impairment or NCD.

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CHAPTER 2

PUBLISHABLE MANUSCRIPT

Title page

Exploring the appropriateness of the Montreal Cognitive Assessment as a culturally sensitive screening test in the Sesotho-speaking population

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Abstract

Background: Neurocognitive disorder (NCD) or dementia, is a progressive neurodegenerative syndrome that causes severe impairment in function. The disease burden of NCD is increasing in middle- and low-income countries as life expectancy increases. In countries with severe resource constraints, low-cost screening tools to diagnose cognitive impairment is imperative, as extensive neurocognitive batteries are rarely feasible. The Montreal Cognitive Assessment (MoCA) is one such screening tool designed for the diagnosis of mild cognitive impairment. Limited studies are available that prove the validity of the MoCA in a South African population.

Aim: We explored the appropriateness of using the MoCA to screen for cognitive impairment in a Sesotho-speaking population.

Setting: The study was conducted in the Free State Province in Bloemfontein. Participants were recruited from National District and Pelonomi Academic Hospitals.

Methods: Ninety-three Sesotho-speaking healthcare users, 18–62 years of age, were recruited. Participants were screened for mental- and other illnesses that could impair cognitive function prior to administration of the MoCA.

Results: Using the normed MoCA cut-off score of 26 false positive outcomes occurred in 67.7% of participants. Although participants with a tertiary level education did perform better than the participants with lower educational attainment, their mean total score was 23.9.

Conclusion: Significant concerns regarding cultural bias in the MoCA were identified, regardless of level of education, indicating that some items might not be culturally fair for the Sesotho-speaking population and yield false positive screening for cognitive impairment. Future research should focus on appropriate substitutes to prevent bias.

Keywords: screening tests; dementia; neurocognitive disorder; Montreal Cognitive Assessment; MoCA; South Africa; language

Introduction

Neurocognitive disorder (NCD) is a non-communicable, progressive syndrome resulting from neurodegeneration that affects several cognitive domains. The impairment associated with NCD is not present at birth or early in life, and is characterised by a notable decline in previous levels of functioning. The aetiology of NCD is often known. Early detection of cognitive impairment is essential in the management of NCD to ensure that reversible causes are treated.[1]

NCD is becoming a growing economic burden worldwide. Approximately 44 million people are affected globally, of which 60% are living in low- to middle-income countries.[2] The total estimated worldwide cost related to NCD was 604 billion US dollar (USD) in 2010.[3] Other factors contributing to the economic burden of NCD include the need for a full-time caretaker. Kalula et al.[4] reported that 79% of patients attending memory clinics in Cape Town were taken care of by family members. Some of these caretakers had to give up their jobs to do so.[4]

Little is known about the prevalence and impact of NCD in South Africa and the need for research is crucial. In a study conducted in the Free State Province, it was found that the prevalence of NCD was approximately 6% in a sample of 200 urban black persons.[5] The burden of NCD in South Africa is expected to increase, which can be attributed to an increase in the anticipated proportion of South Africans above the age of 60 years to 11% of the population by 2030. An increasing number of older adults are also affected by conditions associated with neurodegeneration, such as traumatic brain injury, alcohol dependence and HIV infection.[6]

South Africa has a very diverse population with 11 national languages and multiple ethnic groups. Wide variations in socioeconomic and educational background in the South African population are commonplace. Only 20% of South Africans have completed Grade 12 and approximately one third of the population are functionally illiterate.[7] Due to these factors, the development of screening tests for NCD that have been standardised, validated and adapted to be culturally fair, remains a challenge.

South Africa is in great need of culturally fair screening tests for NCD. Neuropsychological test batteries that are available have culturally related diagnostic issues. Most of these test batteries may not be applicable to uneducated individuals or individuals from cultures in which these batteries have not been standardised. Cross-cultural issues of bias concerning psychometric tests emerged in South Africa as early as the 1920s. Furthermore, these assessments were mostly imported from developed countries since the 1900s.[8]

The gold standard for evaluating cognitive impairment in patients is to administer an extensive neuropsychological assessment. These neuropsychological assessments are often not feasible in a primary healthcare setting, because they are labour-intensive, time-consuming and require expert training to be administered. Therefore, brief screening tools have been developed.[9,10] In the South African setting, these screening tools have become an essential instrument in the diagnosis of cognitive impairment, as neuropsychologists and other diagnostic modalities, such as magnetic resonance imaging (MRI) scans, are often not available.

Screening instruments for cognitive impairment usually consist of systematic, structured questions and tasks and should not be dependent on co-lateral information to complete. It usually takes less than 10 minutes to administer. Personnel administering the screening test should not require more than a few hours of expert training to adequately administer the test. The screening test should be specific and sensitive to both mild NCD and more severe forms of the disease. Screening instruments should preferably not be influenced by a patient's cultural background, ethnicity or level of education.[11]

The standardisation of cognitive screening tests is not a simple task. Regardless, these tests are essential for detecting cognitive impairment in a primary setting. One of these screening tools often used in such settings is the Montreal Cognitive Assessment (MoCA),[12] which has been developed to assist physicians and other health professionals to detect mild cognitive impairment in a primary setting. The MoCA takes approximately 10 minutes to complete and consists of 13 tasks measuring eight cognitive domains, namely visuospatial/executive function, naming, memory, attention, language, abstraction, delayed recall, and orientation. The maximum obtainable score is 30, with a cut-off score of 26 or less being indicative of cognitive impairment. Nasreddine et al.[12] reported that the MoCA has a sensitivity of 90% and a specificity of 87% for detecting mild neurocognitive impairment in patients. The

MoCA was originally developed for use in a North American population of adults at risk of developing Alzheimer's disease, but has since been studied and validated in several countries, including Korea, Japan, Egypt and Portugal.[13–15]

Limited research has been conducted to prove the validity of the MoCA for use in a South African population. As our goal was to evaluate the appropriateness of the MoCA in its current format in the clinical setting, it was administered in English to all participants. Simply translating a cognitive assessment into a desired language does not make the test valid for use in a population. Numerous linguistic, cultural and psychological considerations need to be taken into account. Translation of cognitive assessments involves specific techniques. The first step in the procedure is translation-backtranslation, which involves translating a text into a desired language. Afterwards, a different translator then translates the text back to the source language. The quality of translation is evaluated by comparing the original with the back-translated version of the text for accuracy. A cognitive test that has been interpreted with good linguistic accuracy may not always be culturally fair. For this reason, a second procedure – the committee approach – has to be conducted with the interpreted text. This step involves a group of experts in different fields, such as psychology, linguistics and culture, who evaluate the interpreted text for quality and appropriateness. The committee may also include members of the community.[16]

Robbins et al.[17] investigated the use of the MoCA as a screening tool for HAND among 78 isiXhosa-speaking participants in the Western Cape. Floor effects were observed in complex drawing tasks, rhinoceros naming, serial 7's and abstraction in both the HIV-positive patients and the healthy HIV-negative control group. The control group obtained a mean total score of below 23, which was notably lower than the established cut-off score for NCD. The healthy control group would therefore be classified as impaired, compared to the MoCA normative sample means and standard deviations. Based on their results, Robbins et al. asserted that the MoCA might be wholly inappropriate for a South African population, as it might lead to misclassification of healthy individuals as impaired.[17]

The aim of this study was to explore the appropriateness of the widely used English version of the MoCA as a cognitive screening tool in a healthy Sesotho-speaking population. Currently, a more appropriate translated version is not available in South Africa, therefore, clinical practice typically entails administration of the English version. Firstly, we compared

the total scores of the MoCA between groups with different levels of education. Secondly, we examined the performance of the different groups in individual test items to determine the appropriateness of these items.

Methods

Study design, setting and sample

A descriptive, quantitative study was conducted. A total of 93 Sesotho-speaking South Africans participated in the study. Participants were recruited from different clinics at National District and Pelonomi Academic Hospitals in Bloemfontein. The sample was selected by using non-random, convenient sampling. Participants were eligible for participation if they were 18 years or older, but younger than 65 years of age, and Sesotho was their primary language. Individuals were not eligible if they were known to have any disorder that impairs cognition, such as psychiatric conditions, known neurocognitive or neurodevelopmental disorders, a history of a traumatic brain injury, uncontrolled chronic conditions or if they were HIV positive. A demographic questionnaire and a medical history questionnaire were completed by all the individuals who consented to participate. The purpose of the medical questionnaire was to exclude individuals with any of the conditions listed in the exclusion criteria, as well as conditions that predisposed patients to cognitive impairment such substance abuse and HIV. The Mini Neuropsychiatric Inventory (MINI)[18] was used to evaluate the psychiatric standing of each participant. Written consent to use the MINI in this study was obtained from its developers. The MINI is a brief neuropsychiatric interview divided into sections that assess individuals for any DSM-IV Axis 1 disorders. It takes 15 minutes to administer. Participants suspected to suffer from any undiagnosed psychiatric condition were referred appropriately. The number of potential participants excluded from the study based on these exclusion criteria was not recorded.

Ethical considerations

The Health Sciences Research Ethics Committee (HSREC) of the Faculty of Health Sciences, University of the Free State (UFS), approved the study protocol (ethics reference number UFS-HSD2018/0132). Permission for the research was also granted by the Head of the Department of Psychiatry of the UFS and the provincial Department of Health. Written informed consent was obtained from every individual who met the inclusion criteria and was

willing to participate in the study. Participation was voluntary and anonymous and all information was treated with confidentiality.

Data collection, measures and procedures

The MoCA is a screening test used to assess cognitive function over multiple domains.[12] Executive function is tested in three of the items included in the test, namely the trail making test, the item abstraction task and a phonemic fluency task. The three-dimensional cube drawing and clock drawing tasks are used to determine visuospatial function. Memory is assessed with two immediate recall trails of five items and a five-minute delayed recall trail of the same five items. A digit span task, a tapping test and a serial seven subtraction task are used to assess attention and working memory. Language function is assessed by means of naming, sentence repetition and verbal fluency tasks. Lastly, a participant's orientation is tested by asking them to name the date, month, year and day of the week, as well as their current location and city. There is no minimum level of education a patient is required to have for administration of the MoCA. If a subject has twelve years or less of education, the total score is corrected by adding one point. The principal investigator (JKM) administered the MoCA prior to the introduction of required certification for test users. The MoCA was administered strictly according to procedures stipulated by the MoCA developers. It was administered in English to all the participants, as a more appropriate translated version is not available in South Africa. To reflect current practices in the clinical setting, the English language proficiency of the participants was not assessed.

Analysis of the data

Descriptive statistics, namely means and standard deviations or medians and percentiles, were calculated for continuous data. Frequencies and percentages were calculated for categorical data. The analysis was done by the Department of Biostatistics, UFS.

Results

Sample characteristics

Table 1 summarises the demographic characteristics of our sample of 93 participants. All participants self-identified as Black South Africans with Sesotho as their home language. The overall sample had a mean age of 36.94 years (range 18–62 years). Most of the 93

participants were female. More than half of the participants (n=52; 55.9%) had secondary level education, with all the participants in this group having completed between 10 years and 12 years of education. Thirty-eight (40.9%) participants had tertiary level education, which meant they had a diploma or degree. Only three (3.22%) participants had primary level education, which meant they had attended formal education for 7 years or less. Because the participants with primary level education where so few, they were not included in the group comparisons throughout the study. More than 60% of the participants had formal employment, while approximately half indicated that they were married. The participants with tertiary level education had a much larger formal employment rate than those with secondary level education.

Table 1. Demographic information of participants by level of education.

Variable	Total (n=93)	Level of education	
		10–12 years (n=52)	Tertiary (n=38)
	n (%)	n (%)	n (%)
Gender			
Male	17 (18.3)	11 (11.8)	6 (15.8)
Female	76 (81.7)	41 (78.8)	32 (84.2)
Employment			
Student	15 (16.1)	12 (23.1)	3 (7.9)
Unemployed	17 (18.3)	15 (28.8)	1 (2.6)
Informally employed	2 (2.2)	2 (3.8)	0 (0)
Formally employed	59 (63.4)	23 (44.2)	34 (89.5)
Marital status			
Single	42 (45.2)	23 (44.2)	18 (47.4)
Cohabiting	1 (1.1)	1 (1.9)	0 (0)
Married	49 (52.7)	28 (53.9)	19 (50.0)
Divorced	1 (1.1)	0 (0)	1 (2.6)

MoCA domain and total scores

Regarding the MoCA total scores, 63 (67.7%) participants obtained a total score of 25 or less (see Table 2). The total scores of participants with secondary and tertiary education were compared. The group with tertiary education did perform slightly better than the group with

secondary level education, although the mean total score obtained by both groups was still below the established cut-off score of 26. The median total score of the group with secondary level education was 23.5, correlating well with the mean value. The median total score of the group with tertiary education was 25.0 well above the mean score of 23.9, with both median values still below 26.

With regard to the MoCA domain-specific scores, the participants with tertiary level education performed better than the participants with secondary level education on tests of language. There were no other significant between-group differences in domain-specific scores. Participants with tertiary level education had a mean age of 33.94 years, while participants with secondary level education had a mean age of 38.0 years.

Table 2. Comparison of mean domain and total scores obtained by participants with different levels of education.

Mean domain scores	**Maximum score**	**Total (n=93)**	**Level of education**	
			10–12 years (n=52)	**Tertiary (n=38)**
Visuospatial (clock and cube drawing)	4	3.17	3.28	3.13
Executive (trail making, abstraction)	4	2.21	2.75	2.92
Memory (delayed recall)	5	3.37	3.50	3.50
Attention (tapping, serial 7s, number span)	6	4.39	4.33	4.65
Language (naming, repeat)	5	3.39	3.17	3.84
Orientation	6	5.96	5.98	5.94
Mean total score	**30**	**23.23**	**23.17**	**23.90**

MoCA individual item comparisons

The MoCA normative data were collected from a North American population with a mean age of more than 70 years. The sample consisted of three groups of adults, namely those with no cognitive impairment, those with mild cognitive impairment and those with Alzheimer's disease. These norms were used to establish the current MoCA cut-off score. The mean age of our sample was significantly younger than that of the MoCA normative sample (36.94 years).

To determine whether certain items included in the MoCA might be inappropriate for our sample, we looked at the percentage of individuals who correctly answered the individual items included in each domain. We also compared scores obtained by the participants with secondary level education to scores obtained by participants with tertiary level education. The results are presented in Table 3. Floor effects were observed on several items across both groups. Both groups performed poorly on cube drawing, trail making, fluency, tapping, serial 7s, rhinoceros naming, the second repeat task and delayed recall of the word "daisy". Participants with tertiary level education did perform better than patients with secondary level education on the trail making test, both abstraction tasks, repeating digits backwards, rhinoceros naming, camel naming, both repeat tasks and delayed recall of the word "daisy".

Table 3. Comparison between groups of correct answer provided on individual MoCA items.

Domain	Subset items	Total (n=93)	Level of education	
			10–12 years (n=52)	Tertiary (n=38)
		n (%)	n (%)	n (%)
Visuospatial	Cube copy	50 (53.8)	30 (57.7)	20 52.6)
	Clock contour	93 (100)	52 (100)	38 (100)
	Clock numbers	85 (91.4)	50 (96.2)	33 (86.8)
	Clock hands	67 (72.0)	39 (75.0)	28 (73.7)
Executive	Trail making	45 (48.4)	23 (44.2)	22 (57.9)
	Fluency	52 (55.9)	33 (63.5)	18 (47.4)
	Train – bicycle	86 (92.5)	46 (88.5)	38 (100)
	Watch – ruler	75 (80.7)	41 (78.6)	33 (86.8)
Attention	Digits forward	88 (94.6)	50 (96.2)	35 (92.1)
	Digits backward	72 (77.4)	39 (75.0)	33 (86.8)
	Tapping	46 (49.5)	26 (50.0)	19 (50.0)
	Serial 7's: 4–5 correct	51 (54.8)	28 (53.8)	24 (63.2)
	Serial 7's: 2–3 correct	16 (17.2)	9 (17.3)	7 (18.4)
	Serial 7's: 1 correct	18 (19.4)	10 (19.2)	6 (15.8)
	Serial 7's: 0 correct	8 (8.6)	5 (9.6)	2 (5.3)
Language	Lion	92 (98.9)	52 (100)	38 (97.4)
	Rhinoceros	51 (54.8)	26 (50.0)	25 (65.8)
	Camel	72 (77.4)	36 (69.2)	35 (92.1)
	Repeat 1	72 (77.4)	52 (71.2)	34 (89.5)
	Repeat 2	29 (31.2)	14 (26.9)	15 (39.5)
Delayed recall	Face	67 (72.0)	37 (71.2)	27 (71.1)
	Velvet	65 (69.9)	37 (71.2)	27 (71.1)
	Church	72 (77.4)	42 (80.8)	29 (76.3)
	Daisy	48 (51.6)	24 (46.2)	23 (60.5)
	Red	71 (76.3)	42 (80.8)	27 (71.1)

Discussion

The 93 Sesotho-speaking participants in our study was a relatively small sample size. The sample was recruited by using convenient, non-random sampling, resulting in a non-

representative sample of the Sesotho population in terms of age, gender, level of education and other demographic variables. Keeping these limitations in mind, it is reasonable to argue that our results are not generalisable to the larger South African population.

In our sample of Sesotho-speaking South Africans, most participants scored well below the recommended MoCA cut-off score of 26. Although the participants with tertiary level education did perform better than the participants with secondary level education, specifically in trail making, abstraction and language tasks, it is important to note that mean total scores of both groups was below 24, which is 2 points below the established cut-off score. When considering this cut-off score, most participants in our study would have been misclassified as being cognitively impaired. These findings indicate that because of language, educational or cultural bias, the original English version of the MoCA was not an appropriate screening tool for mild neurocognitive impairment in our study.

Detailed evaluation of performance on each item included in the MoCA, as demonstrated in Table 3, showed clear floor effects in both groups. This might be an indication that specific MoCA tasks might not be appropriate in this cross-cultural setting, irrespective of educational attainment.

Participants from both groups did not perform well in the trail making and cube drawing task. This might be an indication that complex drawing tasks are not appropriate for this particular population. Most participants also struggled with the fluency task, for the participant has one minute to name at least 11 words starting with the letter "F". In the Korean version of the MoCA the phonemic fluency task was replaced by a semantic fluency task, where the participant named animals.[14] Animal naming might be a more suitable fluency task in the Sesotho-speaking population. Alternatively, phonemes with an equivalent frequency and distribution than the letter "F" in the Sesotho language need to be used for this population. Although the rhinoceros is indigenous to South Africa, both groups performed poorly on the rhinoceros naming task and commonly mistaken it for a buffalo or hippopotamus.

Both groups also performed poorly on the serial 7's task, with nearly half of the participants scoring 3 or less out of five. Participants in both groups did not perform well on the second repetition task. Since all the participants' home language was Sesotho, this might indicate that sentences with similar grammar, word count and syllabic count would need to be found in

Sesotho for this population. Concerning the delayed recall task, participants had the greatest difficulty recalling the words "velvet" and "daisy". The poor performance of both groups on these items might be an indication of test-bias and would need further investigation to determine the reason for this pattern of performance.

Access to quality education may impact significantly on an individual's performance on cognitive measuring instruments. The racial segregation policies adopted by the previous South African government contributed to current socio-economic inequalities that are widely accepted as influencing the performance of certain groups on psychological tests.[19,20] The lack of access to quality educational resources could have had a cross-generational effect with long-term consequences, which could explain our results. Participants might not have had adequate exposure form an early age to the tasks included in the MoCA, such as complex drawing tasks. Therefore, it is essential that healthcare professionals administering cognitive screening tests take educational, language and cultural bias into account to ensure the appropriate interpretation of test results. Further research is necessary to standardise cognitive screening instruments for our sample population and explore more appropriate test items to assess each cognitive domain.

Although these findings might emphasise the necessity for locally standardised assessments for cognitive impairment in South Africa, our study did have several limitations. Firstly, non-random convenient sampling was used that focused on a narrow section of the Sesotho-speaking population. Secondly, we also had a small sample. These factors may impair generalisation of our results within the target population and to other South African language groups. Thirdly, although screening for risk factors for neurocognitive disorder was done in an effort to ensure that participants were cognitively intact, all confounding factors could not be controlled for by our exclusion criteria. Without performing special investigations, such as neuroimaging or neuropsychological testing, we could not exclude pre-existing neurocognitive impairment with certainty. Furthermore, although only a small number of our participants had 7 years or less of education, we had no means to screen the quality of education received by the participants with secondary and tertiary level education. Future studies will need to include a larger and more representative sample of the Sesotho-speaking population and take into account that participants might have received education of substandard quality. Finally, both the Mini Neuropsychiatric Inventory[18] used to screen for pre-existing mental illness and the MoCA were administered in English, as they are not

available in Sesotho. This could have substantial impact on our results because of a possible language barrier. The English proficiency of participants in the sample was not assessed and the degree to which language, therefore, impacted performance in this study is unknown. However, the study set out to assess whether the MoCA in its widely used English format would be appropriate to use within the Sesotho-speaking population. Future studies should focus in the appropriateness of translated versions of the MoCA within different South African language groups.

Conclusion and recommendations

Several items in the English version of the MoCA might render it an invalid screening tool when used unconditionally to screen for mild cognitive impairment in the Sesotho-speaking population. The assessment of English language proficiency prior to administration of the MoCA may be required in order to better appreciate the potential impact of language during interpretation of the results. Floor effects were observed with the trail making test, cube drawing, serial 7's, fluency, rhinoceros naming and the second repeat task. Future research should focus on alternative items that contain less language, cultural or educational bias, in an effort to develop standardised cognitive screening tests for the Sesotho-speaking population. Furthermore, research should be conducted on the development of cognitive screening instruments in all the official South African languages as administration of screening tests in languages other than the subject's home language might have an impact on the scores of these tests.

Research is therefore necessary to assess the appropriateness of specific items included in the MoCA to attempt validation of the instrument for our target population. It could also assist in the validation and development of cognitive assessments across all modalities that enable effective healthcare screening services to be rendered to all South African population groups.

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APPENDIX A

LETTER OF APPROVAL: HEALTH SCIENCES RESEARCH ETHICS COMMITTEE

APPENDIX B

PERMISSION FROM THE FREE STATE PROVINCE DEPARTMENT OF HEALTH

APPENDIX C

PERMISSION TO USE THE MINI 7.0.2

APPENDIX D

RESEARCH PROTOCOL

APPENDIX E

PARTICIPANT INFORMATION FORM AND CONSENT FORM

APPENDIX F

DATA COLLECTION FORMS

APPENDIX G

SOUTH AFRICAN JOURNAL OF PSYCHIATRY AUTHOR GUIDELINES

South African Journal of Psychiatry 2019

Submission Guidelines

Abridged structure

- Original Research Article
- Review Article
- Scientific Letter
- Letters to the editor
- Obituaries
- Editorials
- Case Report
- Cover Letter

Full structure

- Original Research Article
- Review Article
- Case Report

Overview

The author guidelines include information about the types of articles received for publication and preparing a manuscript for submission. Other relevant information about the journal's policies and the reviewing process can be found under the about section. The **compulsory cover letter** forms part of a submission and must be submitted together with all the required forms. All forms need to be completed in English.

Original Research Article

An original article provides an overview of innovative research in a particular field within or related to the focus and scope of the journal, presented according to a clear and well-structured format. Systematic reviews should follow the same basic structure as other original research articles. The aim and objectives should focus on a clinical question that will be addressed in the review. The methods section should describe in detail the search strategy, criteria used to select or reject articles, attempts made to obtain all important and relevant studies and deal with publication bias (including grey and unpublished literature), how the quality of included studies was appraised, the methodology used to

extract and/or analyse data. Results should describe the homogeneity of the different findings, clearly present the overall results and any meta-analysis.

Word limit	3000-4000 words (excluding the structured abstract and references)
Structured abstract	250 words to include a Background, Aim, Setting, Methods, Results and Conclusion
References	60 or less
Tables/Figures	no more than 7 Tables/Figure
Ethical statement	should be included in the manuscript
Compulsory supplementary file	ethical clearance letter/certificate

Review Article

Review articles provide a comprehensive summary of research on a certain topic, and a perspective on the state of the field and where it is heading. These articles are often meta-analyses comparing and combining findings of previously published studies. See full structure of review articles below.

Word limit	2500-4000 words (excluding the abstract and references)
References	15 or less
Structured abstract	250 words to include a Background, Aim, Setting, Methods, Results and Conclusion
Tables/Figures	data in the text should not be repeated extensively in tables or figures

Scientific Letter

Original research that is limited in scope can be submitted as a scientific letter rather than a full original research article.

Word limit	1500 words
References	6 or less
Tables/Figures	no more than 1 Table/Figure

Letters to the editor

They may be subjected to the peer review process and their eventual placement is at the discretion of the editorial team. Kindly include include a correspondence address.

Word limit	400 words

Tables/Figures	no more than 1 Table/Figure

Obituaries

Is a news article that reports the recent passing of a person, typically along with an account of the person's work achievement and life.

Word limit	400 words
Photo	a photograph of the deceased

Editorials

Editorials are by invitation only and are intended to provide expert comment on relevant topics within the focus and scope of the journal.

Word limit	800 words
References	10 or less

Case Report

The case report should highlight a critical issue that is relevant to the field of psychiatry.

Word limit	1500 words (excluding the unstructured abstract and references)
Unstructured abstract	75 words to cover a Background, Aim, Method, Results and Conclusion
References	15 or less
Tables/Figures	no more than 6 Tables/Figure
Ethical statement	should be included in the manuscript
Compulsory supplementary file	ethical clearance letter/certificate

Cover Letter

The format of the compulsory cover letter forms part of your submission. Kindly download and complete, in English, the provided cover letter.

Anyone that has made a significant contribution to the research and the paper must be listed as an author in your cover letter. Contributions that fall short of meeting the criteria as stipulated in our

policy should rather be mentioned in the 'Acknowledgements' section of the manuscript. Read our **authorship** guidelines and **author contribution** statement policies.

Original Research Article full structure

Title: The article's full title should contain a maximum of 95 characters (including spaces).

Abstract: The abstract, written in English, should be no longer than 250 words and must be written in the past tense. The abstract should give a succinct account of the objectives, methods, results and significance of the matter. The structured abstract for an Original Research article should consist of six paragraphs labelled Background, Aim, Setting, Methods, Results and Conclusion.

- Background: Summarise the social value (importance, relevance) and scientific value (knowledge gap) that your study addresses.
- Aim: State the overall aim of the study.
- Setting: State the setting for the study.
- Methods: Clearly express the basic design of the study, and name or briefly describe the methods used without going into excessive detail.
- Results: State the main findings.
- Conclusion: State your conclusion and any key implications or recommendations.

Do not cite references and do not use abbreviations excessively in the abstract.

Introduction: The introduction must contain your argument for the social and scientific value of the study, as well as the aim and objectives:

- Social value: The first part of the introduction should make a clear and logical argument for the importance or relevance of the study. Your argument should be supported by use of evidence from the literature.
- Scientific value: The second part of the introduction should make a clear and logical argument for the originality of the study. This should include a summary of what is already known about the research question or specific topic, and should clarify the knowledge gap that this study will address. Your argument should be supported by use of evidence from the literature.
- Conceptual framework: In some research articles it will also be important to describe the underlying theoretical basis for the research and how these theories are linked together in a conceptual framework. The theoretical evidence used to construct the conceptual framework should be referenced from the literature.
- Aim and objectives: The introduction should conclude with a clear summary of the aim and objectives of this study.

Research methods and design: This must address the following:

- Study design: An outline of the type of study design.
- Setting: A description of the setting for the study; for example, the type of community from which the participants came or the nature of the health system and services in which the study is conducted.
- Study population and sampling strategy: Describe the study population and any inclusion or exclusion criteria. Describe the intended sample size and your sample size calculation or justification. Describe the sampling strategy used. Describe in practical terms how this was implemented.
- Intervention (if appropriate): If there were intervention and comparison groups, describe the intervention in detail and what happened to the comparison groups.
- Data collection: Define the data collection tools that were used and their validity. Describe in practical terms how data were collected and any key issues involved, e.g. language barriers.
- Data analysis: Describe how data were captured, checked and cleaned. Describe the analysis process, for example, the statistical tests used or steps followed in qualitative data analysis.
- Ethical considerations: Approval must have been obtained for all studies from the author's institution or other relevant ethics committee and the institution's name and permit numbers should be stated here.

Results: Present the results of your study in a logical sequence that addresses the aim and objectives of your study. Use tables and figures as required to present your findings. Use quotations as required to establish your interpretation of qualitative data. All units should conform to the SI convention and be abbreviated accordingly. Metric units and their international symbols are used throughout, as is the decimal point (not the decimal comma).

Discussion: The discussion section should address the following four elements:

- Key findings: Summarise the key findings without reiterating details of the results.
- Discussion of key findings: Explain how the key findings relate to previous research or to existing knowledge, practice or policy.
- Strengths and limitations: Describe the strengths and limitations of your methods and what the reader should take into account when interpreting your results.
- Implications or recommendations: State the implications of your study or recommendations for future research (questions that remain unanswered), policy or practice. Make sure that the recommendations flow directly from your findings.

Conclusion: Provide a brief conclusion that summarises the results and their meaning or significance in relation to each objective of the study.

Acknowledgements: Those who contributed to the work but do not meet our authorship criteria should be listed in the Acknowledgments with a description of the contribution. Authors are responsible for ensuring that anyone named in the Acknowledgments agrees to be named.
Also provide the following, each under their own heading:

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Review Article full structure

Title: The article's full title should contain a maximum of 95 characters (including spaces).

Abstract: The abstract should be no longer than 250 words and must be written in the past tense. The abstract should give a concise account of the objectives, methods, results and significance of the matter. The abstract can be structured and should consist of five paragraphs labelled Background, Aim, Method, Results and Conclusion.

- Background: Why is the topic important to us? State the context of the review
- Aim: What is the purpose of your review? Describe the aim or purpose of your review.
- Method: How did you go about performing the review? Describe the methods used for searching, selecting and appraising your evidence.
- Results: What are the findings? What are the main findings of your literature review.
- Conclusion: What are the implications of your answer? Briefly summarise any potential implications.

Introduction: Present an argument for the social and scientific value of your review that is itself supported by the literature. Present the aim and objectives of your literature review.

Methods: Although this is not a systematic review (see instructions on original research for this type of article) it is still necessary to outline how you searched for, selected and appraised the literature that you used. Discuss any methodological limitations.
Review findings: Present your review of the literature and make use of appropriate sub-headings. Your review should be a critical synthesis of the literature.
Implications and recommendations: Discuss the findings of your review in terms of the implications for policy makers and clinicians or recommendations for future research.
Conclusion: This should clearly state the main conclusions of the review in terms of addressing the original aim and objectives.

Acknowledgements: Those who contributed to the work but do not meet our authorship criteria should be listed in the Acknowledgments with a description of the contribution. Authors are responsible for ensuring that anyone named in the Acknowledgments agrees to be named.
Also provide the following, each under their own heading:

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References: Authors should provide direct references to original research sources whenever possible. References should not be used by authors, editors, or peer reviewers to promote self-interests. Refer to the journal referencing style downloadable on our *Formatting Requirements* page.

Case Report full structure

Title: The article's full title should contain a maximum of 95 characters (including spaces).

Abstract: The abstract should be no longer than 250 words and must be written in the past tense. The abstract should give a concise account of the Introduction, Patient presentation, Management and outcome and significance of the matter. The abstract can be structured and should consist of four paragraphs labelled Introduction, Patient presentation, Management and outcome, and Conclusion.

- Introduction: Describe the context and the reason for publishing this patient study.
- Patient presentation: Describe your 3-stage assessment of the patient.
- Management and outcome: Describe the management plan, progress and final outcome.
- Conclusion: Summarise the lessons learnt and key implications or recommendations.

Introduction: Convey clearly what is particularly interesting about the patient that you want to describe to the reader. It is useful to begin by placing the study in a historical or social context. If similar cases have been reported previously, please describe them briefly. Clarify your aim or objectives in publishing this patient study.

Ethical considerations: Papers based on a case study that involves the treatment of humans must adhere to the Declaration of Helsinki on Ethical Principles for Medical Research Involving Human Subjects. Specify the recognised ethics committee from which approval for the case study was obtained; also state the serial number of the ethical clearance. Case studies must have the consent of the patient(s) or waiver of consent approved by an ethics committee.

Patient presentation: Describe your patient in detail with consideration of the following aspects:

- Describe the information that was gathered on the patient's medical problem(s) from the consultation, physical examination and results of any investigations.
- Describe the information that was gathered on the patient's perspective of their illness (loss of function, ideas, beliefs, concerns, expectations, or feelings)
- Describe the information that was gathered on the patient's context (family structure and function, occupational issues, environment)
- Provide a 3-stage assessment of the patient's clinical, individual and contextual issues.

Management and outcome: In this section, you should clearly describe the plan for care, as well as the care that was actually provided, how the patient's condition progressed over time and the final outcome.

Discussion: Summarise the key points, lessons learnt and discuss these in relation to the literature. Clarify the implications or recommendations that arise from this patient study.

Acknowledgements: Those who contributed to the work but do not meet our authorship criteria should be listed in the Acknowledgments with a description of the contribution. Authors are responsible for ensuring that anyone named in the Acknowledgments agrees to be named. Also provide the following, each under their own heading:

- Competing interests: This section should list specific competing interests associated with any of the authors. If authors declare that no competing interests exist, the article will include a statement to this effect: *The authors declare that they have no financial or personal relationship(s) that may have inappropriately influenced them in writing this article.* Read our policy on competing interests.

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- Funding: Provide information on funding if relevant
- Disclaimer: a statement that the views expressed in the submitted article are his or her own and not an official position of the institution or funder.

References: Authors should provide direct references to original research sources whenever possible. References should not be used by authors, editors, or peer reviewers to promote self-interests. Refer to the journal referencing style downloadable on our *Formatting Requirements* page.

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Please review the checklist below to prepare your manuscript. This will help to make sure your submission is complete and gets handled as quickly as possible.

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APPENDIX H

DECLARATION OF TECHNICAL AND EDITORIAL ASSISTANCE

DECLARATION OF TECHNICAL AND EDITORIAL ASSISTANCE

TO WHOM IT MAY CONCERN

I hereby declare that with regard to the following document:

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Title: Exploring the appropriateness of the Montreal Cognitive Assessment as a culturally sensitive screening test in the Sesotho-speaking population

- I have performed the language editing (grammar, vocabulary and syntax).
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DR. DALEEN STRUWIG
BSc, BSc (Hons), MMedSc, PhD

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Date: 9 April 2020

APPENDIX I

TURNITIN PLAGIARISM REPORT