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Malaysian Adaptation of the Mini-Addenbrooke's Cognitive Examination (M-ACE)

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Abstract: The Mini-Addenbrooke's Cognitive Examination (M-ACE) is a sensitive and specific instrument for the detection of mild cognitive impairment and dementia. While the first version of the test tool has been adapted in various countries, its mini version has not adapted in Malaysia. The study aims to translate and adapt the M-ACE for use in the Malaysian population from M-ACE UK Version C (2014). Two separate translations were conducted from English into Malay, followed by two separate back-translations. Three academic experts validated the content after the translation. Little adaptations in agreement to the Malaysian culture and language were made and a first version of the instrument produced. This former version of the M-ACE was administered to 24 cognitively healthy individuals aged 60 years or more, with various scholastic stages. The average age of the investigated sample of healthy elderly was 65.4±9.3 years and male 54.2%. Small additional adjustments were essential after the assessment of the first twelve subjects to improve comprehension of the test. The final Malay version of the M-ACE was produced and was found to be well understood by the remaining 12 subjects, taking an average of 5 minutes to be administered. The Malay version of the M-ACE ascertained to be a hopeful cognitive tool for examining both in clinical settings and research. This study is the earliest to apply the M-ACE to a Malay-speaking nation and it validates the effectiveness of this test as a cognitive screening tool.

Key words: Cognitive evaluation · Dementia · Diagnosis · Mini-Addenbrooke's Cognitive Examination · Cultural adaptation · Malaysia

INTRODUCTION

The Addenbrooke's Cognitive Examination (ACE) was initially established as a theoretically inspired extension of the Mini-Mental State Examination (MMSE) which attempted to address the neuropsychological omissions and improve the screening performance of the latter. Though taking elongated to administer than the MMSE and consequently best matched to specialist settings, ACE and its consequent restatements, ACE-R, ACE-III and M-ACE have proved easy to use, acceptable to patients. ACE-R, ACE-III and M-ACE have shown excellent diagnostic utility in identifying dementia and cognitive impairment in a variety of clinical situations. Mini-Addenbrooke's Cognitive Examination (M-ACE) taking no additional time to manage than the MMSE but, like the longer versions are superior to MMSE in diagnostic utility. The utility of ACE/ACE-R has prompted translation into various languages and this trend is anticipated to continue for ACE-III and M-ACE [1].

Mild Cognitive Impairment (MCI) is well-defined as the pre-dementia state that is associated with an increased risk of developing dementia. MCI helps to identify individuals who may progress further to Cognitive impairment (CI) [2]. MCI is characterized by memory complaints without a severe effect on activities of daily life [3]. Dementia is associated with a decrease in remembrance, communication and reasoning which interfere with the normal daily activity [4]. In 2014, extra than 5 million persons in the U.S. had Alzheimer's disease, with 1 in 9 individuals aged >65 years had the illness [5]. The Mini-Addenbrooke's Cognitive Examination (M-ACE) is an additional tool which has similar characteristics of ACE. M-ACE has not been studied in Malaysian population to date. The M-ACE is a brief and reliable test tool that delivers recognition of early periods of dementia and is also effective in distinguishing its subtypes, such as Alzheimer's disease, frontotemporal dementia (FTD) and other features of dementia associated with parkinsonism [6]. The test can be administered in

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about 5 minutes, provides a more thorough evaluation of five cognitive domains (Attention, memory, verbal fluency, visuospatial ability and memory recall). Each of these domains can be individually evaluated [7, 8].

The Mini-Addenbrooke's Cognitive Examination was subsequently developed and data on this new version has recently been published by Hsieh *et al*. 2015. In this new version, called M-ACE, the structure and the sequence of the tasks have been thoroughly reworked to facilitate its use. The content was also reformed to simplify future translations, permitting editions and use in other cultures, moreover slightly increasing the instrument's sensitivity level. Furthermore, the M-ACE now has three versions (A, B and C). Another difference from the original version was that instead of six, the M-ACE assesses only five domains, namely: attention (4 points), memory (7 points), verbal and language fluency (7 points), visuospatial ability (5 points) and memory recall (7 points). The person's total score is still gotten by the addition of all subtests' scores, ranging from 0 to 30 [9, 10].

The evaluation of cognition is serious for the discovery and discrepancy identification of dementias. It has significant clinical consequences for the personal care, including access to treatment options, indicators for rates of survival, competency to drive and capacity to give informed consent, plus psychosocial factors such as whether patients can live independently at home, career burden and quality of life. Shorter cognitive screening tests are particularly useful in a busy clinic where resources may not permit more comprehensive neuropsychological testing [11, 12]. While the novel version has formerly been studied in numerous countries, such as Spain [13]. The M-ACE has not yet been investigated in Malaysia. This study intends to translate and adapt the M-ACE for practice on the Malaysian population from M-ACE UK Version C (2014).

MATERIALS AND METHODS

The process of M-ACE adaptation was initiated by two independent translations from English to Malay, followed by two back-translations of these Malay versions into English. Three academic experts validated the content after translation; this work aimed to reveal the possible misunderstandings and ambiguities that the translated version could have contained. Subsequently, cross-cultural adaptation was carried out. Well known Malaysian ecosystem, in the language-reading, the words were chosen to have similar levels of difficulty in Malay and English. The M-ACE Malaysian version instrument took its final form after a pilot study test. In this study, 24 healthy individuals were tested, aged 60 years or more, with different educational levels, uneducated people were excluded. All participants had no history of the neurologic or psychiatric disease, stroke, paralysis, blindness as well as no history of cognitive degeneration. Initially, 12 subjects were delivered to the Malay first version and this experience highlighted some additional modifications which were necessary. Following this, the final Malay version of the M-ACE was produced and then administered to the remaining 12 participants. The study was permitted by the Ethics Committee of the Hospital Pulau Pinang and by the Ethics Committee of Universiti Sains Malaysia. All members signed a written informed consent.

RESULTS

The 24 elderly subjects presented a mean age of 65.4± 9.3 years, ranging from 60 to 82 years. About 13(54.2%) of the participants were male and 11(45.8%) female. The mean number of years of formal education was 18.7±3.3 (ranging from 15 to 22 years). The lowest total score observed in the M-ACE was 19, while the highest was 30. The mean total score in the battery was of 25.5±4.1 points. Minimum and maximum total scores perceived, as well as averages and standard deviations for the subtests of the test, are described in Table 1. The instrument took 5 minutes in the average to be managed. The understanding of the various items of the test was found to be good.

Table 1: The Demographic Data of the Sample and M-ace Scores

n= 24	Minimum	Maximum	Mean (SD)	Maximum score
Age	60	82	65.4 (9.3)	–
Schooling (in years)	15	22	18.7 (3.3)	–
M-ACE scores				
Attention	3	4	3.2(0.8)	4
Memory	5	7	6.3(0.5)	7
Fluency	4	7	6.2(0.7)	7
Visuospatial	3	5	4.3(0.7)	5
Memory recall	4	7	5.5(1.4)	7
Total score	19	30	25.5(4.1)	30

DISCUSSION

In this project, Mini-Addenbrooke's Cognitive Examination (M-ACE) UK English version C (2014) was translated and adapted to the Malay (Mini – Pemeriksaan Kognitif Addenbrooke the Malay version (Malaysia) (2016)) to be used in Malaysia (available via contact with the authors). After its submission on half of the sample,

some additional amendments were completed to render it easier to comprehend by the low schooling level individuals. Apparently, these modifications did not interfere with the original objectives of the battery authors. The final tool showed to be easy to administer and was well understood by a group of healthy older adults with the varied educational background. M-ACE Malay version 2016 was distributed in an average of 5 minutes.

Cognitive evaluation constitutes a valuable tool for the assessment of cerebral functioning, being mandatory for the differential diagnosis of healthy elderly, MCI, dementia and its different types. Sensitivity and specificity are vital facets of a cognitive investigative tool, but these also depend on knowledge of the imperative diversities and impacts amongst age, beliefs, learning level and gender. Age is the most crucial hazard factor for the progress of cognitive deterioration and dementia. However, memory concerns are also predominant in younger age individuals, prompting referral of such patients from primary care to dedicate [14, 15]. Numerous persons will work into their late 60s or even their early 70s. Older health care workers tend to suffer from drink, poly-pharmacy [16-20], drug interactions [21], Medications non-adherence [22], falling, bone fractures [23]. Also, the older persons suffer from chronic kidney disease [24-28], surgery, infections, asthma [29], uncontrolled glycemia [30-32] hypertension crisis [33, 34], anemia [35], depression and dementia [36]. Studies show negative correlations among performance on cognitive testing and job performance problems [37] or with age [38]. One study found a cognitive deficiency in physicians was accountable for 63% of all adverse medical events with most being preventable [39]. As populations age throughout the world, inevitably there will be a growth in illnesses concomitant with aging, such as chronic kidney disease (CKD) [40], diabetes [41], as well as cerebrovascular [42] and neurological disorders [43-45]. The prevalence of dementia and its associated social and economic costs will rise exponentially with the aging population.

Detection of cognitive deficiency helps in determining any risk to the patient safety and to safeguard patients by designing and applying for effective remediation programs. Dementia UK [46] evaluations that 1.3% of persons aged 65–69 years have dementia increasing to 2.9% for those aged 70–74 years. Smaller degrees of cognitive deficiency can be more communal in public at these ages, growing mandate on occupational physicians to evaluate older workers for the potential cognitive decline. Mild cognitive impairment converts to dementia at a rate of ~10% per year [47], a clinical encounter due to the diversity and often dynamic nature of symptoms. There is a necessity to define whether cognitive impairment is present but also to find which cognitive domains are affected by knowledge and skills mandatory by the person's occupation [48-50]. Screening must be efficient, cost advantageous with proper approaches and therapeutic evidence. Patients may execute unwell on prescribed cognitive tests for other explanations, containing acute sickness, anxiety, depression, fatigue, ache, discomfort, sleep lack, medicines, not wishing to involve with challenging, language obstacles, cultural matters and education inability. Therefore these examinations be a part of the overall clinical evaluation and clarity is required as to the level of detail crucial for screening, variance identification or full neuropsychological analysis [51].

As outlined previously, brief cognitive evaluation instruments validated in Malaysia stay scarce. Moreover, the disparity diagnosis between AD and FTD signifies a challenge, especially in the early stages and even fewer tools are available in Malay with this regard. This study represents a significant contribution for clinicians since it describes the performance of a group of healthy older adults in an executive function brief evaluation tool. M-ACE has shown good sensitivity in detecting frontal lobe dysfunction and also in differentiating AD from FTD patients. However, the Frontal Assessment Battery (FAB) assesses only some aspects of executive functions, while the M-ACE consists of the assessment of different cognitive domains, such as attention, memory, verbal fluency, visuospatial ability and memory recall [52-55]. Therefore, the Malaysian version of the M-ACE seems to be a promising tool for clinical use and therefore warrants validation in the Malaysian population.

In 2016, Peter Hobson and his colleagues tested the utility of the Mini-Addenbrooke's Cognitive Examination (M-ACE) in a cohort of older adults with chronic kidney disease (CKD) and diabetes. The M-ACE was administered to 112 CKD and diabetes patients attending a nephrology clinic. Cognitive impairment was based upon patient, informant and case review, neuropsychological assessment and application of criteria for mild cognitive impairment (MCI) and the Diagnostic and Statistical Manual of Mental Disorders, fifth edition for dementia. The M-ACE was also compared to the Mini-Mental State Examination (MMSE). They found upon assessment, 52 patients had normal cognitive function, 33 had MCI and 27 had dementia. The part under

the receiver operating curve for the M-ACE was 0.96 (95% CI 0.95–1.00). The sensitivity and specificity for a dementia diagnosis were 0.96 and 0.84 at the cut point <25 and 0.70 and 1.00 at the cut point <21. Mean M-ACE scores differed significantly between normal, demented and MCI groups ($p < 0.001$) and compared to the MMSE, the M-ACE did not suffer from ceiling effects. The M-ACE is an easily administered test with excellent sensitivity and specificity to capture and assist in the diagnosis of MCI or dementia in patients with CKD and diabetes [56]. Mild cognitive impairment (MCI) may represent an early and potentially treatable, the correct clinical identification of the phase of dementing disorders is therefore of paramount importance [57].

CONCLUSION

The Malay version of the M-ACE proved to be a promising cognitive instrument for testing both in research and clinical settings. In conclusion, this study is the first to apply the M-ACE to a Malay-speaking population and it demonstrates the usefulness of this scale as a cognitive screening test. The short time required to administer the M-ACE suggests that this tool may be useful in centers with a greater care load or in less specialized centers. Also, the higher sensitivity and specificity of the M-ACE compared to the ACE-III supports using the former even when the original long form is also administered. The M-ACE would, therefore, serve two purposes in neuropsychological assessment: it is a screening tool, especially when combined with the ACE-III and also a short neuropsychological test since it evaluates the domains (attention, language, memory, verbal fluency and visuospatial fluency) which assessed by the ACE-III. The M-ACE can detect cognitive impairment and dementiaat an early stage and could be employed to screen patients in the primary and secondary care settings.

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