

Adaptation and Validation of the Tamil (Sri Lanka) Version of the Montreal Cognitive Assessment

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Abstract

The study aimed to develop the Tamil (Sri Lanka) version of the Montreal Cognitive Assessment (MoCA) and investigate its reliability and validity as a brief screening tool for mild cognitive impairment (MCI). Tamil-speaking Sri Lankan elderly with normal cognition and MCI were recruited from a neurology clinic. Adaptation of the English MoCA to the Tamil (Sri Lanka) involved context-specific content modification and translation. The content validity, reliability, sensitivity, and specificity of the tool were evaluated. Study participants were 184 older adults, comprising 85 with normal cognition and 99 neurologist-diagnosed MCI. The tool had high internal consistency (Cronbach's alpha = 0.83). Receiver operating characteristic curve analyses showed an area under the curve of 0.87 (95% CI = 0.83 - 0.91) for detecting MCI. The optimal cut-off score for detection of MCI was 23/24, yielded a sensitivity and specificity of 84.7% and 76.4%, respectively. The Tamil (Sri Lankan) version of the MoCA maintains its core diagnostic properties rendering it a valid and reliable tool for screening of MCI among Tamil speaking Sri Lankan older adults.

Keywords: elderly, mild cognitive impairment, Montreal Cognitive Assessment, Sri Lanka, Tamil

Introduction

Mild cognitive impairment (MCI) refers to an intermediate transitional cognitive phase between cognition of normal aging and mild dementia. Individuals with MCI carry a high risk of deterioration to Alzheimer's disease (AD) and other dementias relative to cognitively normal individuals. In 2005, the Montreal Cognitive Assessment (MoCA) was reported to be a better screening test for MCI than the Mini-Mental State Examination (MMSE) among English and French-speaking persons.^{1,2} While the MoCA had a sensitivity and specificity of 90% and 87%, respectively for detecting MCI, the MMSE, which is widely used by primary care physicians to screen for dementia, had a sensitivity of only 18% for MCI.² Consequently, use of the MoCA for screening for MCI has become pervasive in many countries. At the same time translation and validation studies of the MoCA have confirmed its validity as a screening test for MCI in several countries, including South Korea, China and Sri Lanka.³⁻⁵

In Sri Lanka, a South Asian country, only the Sinhala language version of the MoCA, but not the Tamil

language version has been validated.⁵ Sri Lanka has a population of about 21 million with the aging population of 12.2%.⁶ Sinhala and Tamil are major languages spoken in the country with Tamil spoken by about 5 million individuals. Globally, Tamil is spoken by 75.8 million people, an official language in three countries (India, Sri Lanka, and Singapore) and is also common in Australia, Canada, Malaysia, Mauritius, and Burma. At the same time, many dialects (versions) of the spoken Tamil language, which vary from each other, are used in different geographical regions of the world.⁷ Such variations are even existent across regions in close geographical proximity; for instance, the vocabulary and grammar used by speakers in Sri Lanka varies substantially that used by Tamil speakers in India. For this reason, the Tamil version of the MoCA developed in India was not directly applicable to Sri Lanka. Further, details on the validity of the Tamil (India) version of the MoCA are not available; and, given the difference in literacy rates of the two countries (Sri Lanka: 92.6% and India: 72.1%), and that educational level impacts the MoCA cut-off score for the detection of MCI, the Tamil

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(India) version of the MoCA is may not applicable to the Tamil-speaking population of older Sri Lankans.⁸ Thus, a culturally appropriate Tamil (Sri Lanka) version of the MoCA with good psychometric properties is required to provide efficient and accurate screening of Tamil-speaking Sri Lankan older adults for MCI. The present study, therefore, aims to develop the Tamil (Sri Lanka) version of the MoCA and investigate its reliability and validity as a brief screening tool for MCI among Tamil-speaking Sri Lankan older adults.

Method

The study design was an institutional based descriptive cross-sectional study. The study population was ambulatory, community-dwelling, Tamil-speaking Sri Lankan older adults recruited from the Neurology Clinic of Teaching Hospital Jaffna in Northern Sri Lanka. Approval of the research protocol from the Institutional Review Board (IRB), at the University of Jaffna was obtained (Ref. No: J/ERC/13/42/DR/0010). Written informed consent was obtained from all participants. All the MCI patients were able to give the consent without any difficulties.

Samples were recruited based on the calculated sample size a total of 184 older adults, comprising 85 with normal cognition and 99 neurologist - diagnosed MCI were recruited. For all participants, the inclusion criteria included age 60 years or older and the availability of an informant (e.g., a caregiver). The exclusion criteria were those with cancer within five years, an active infection, and end-stage renal or other organ failure; non-ambulatory; those diagnosed with depression,⁹ deafness, and other communication barriers.

The study instrument, MoCA is a one-page scale. It measures eight cognitive domains with 10 items, and includes tests on short-term memory recall, visuospatial abilities, multiple aspects of executive functions, phonemic verbal fluency, abstraction, attention, concentration and working memory, language function, time, and place orientation. The MoCA can usually be completed in 10 minutes. In the original English and French MoCA version, one point is added for individuals with 12 or fewer years of education. The highest possible score is 30 points, and a higher score is indicative of better cognitive status.

The study obtained permission to use the MoCA from its developer.² The original English version of the MoCA was first translated into Tamil (Sri Lanka) by three bilingual Tamil-speaking Sri Lankan medical professionals (Community Physician, Psychiatrist and Neurologist) separately, and the final version was approved with the consensus of all the experts participated in the translation. Subsequently, this version was back-translated into English by a native Tamil

speaker who was unfamiliar with the English version of the MoCA.

In arriving at the final MoCA-Tamil (Sri Lanka), the following linguistic and cultural adaptations were made: (1) trail making test: the first five letters of the English alphabet were replaced with the first five letters of the Tamil alphabet; (2) naming test: pictures of a rhinoceros, and a camel were replaced with pictures of an elephant and a cow as the local community is more familiar with the latter animals than the former; (3) memory test: while two (face and red) of the five original words were retained, the rest (velvet, church, and daisy) were replaced. The 'velvet' was replaced by Tamil word for 'silk' as silk is a commonly used cloth material. The 'church' was replaced by Tamil word for 'temple' because most Tamil-speaking Sri Lankans follow the Hindu religion. And instead of 'daisy', 'jasmine', was selected; (4) test of attention for letters: the English alphabet was replaced with Tamil letters having a corresponding sound; (5) language repetition: the English version of MoCA has two sentences. The first sentence was translated to retain the same meaning and same number of words; but, the name 'John' was replaced with 'Kannan'. The second sentence was translated to retain the same number of words and also the same meaning without any corrections; (6) verbal fluency test: in the original tool, this test involved naming a maximum number of words beginning with letter 'F'. The corresponding Tamil 'F' is not used commonly. Therefore, it was replaced with the letter 'P'; (7) test for abstraction: this was included identification of similarity of three paired things. In the original tool, these pairs were 'banana - orange', 'train - bicycle', and 'watch - ruler'. During the process of adaptation, 'banana - orange' was retained without any change; but, 'train' was replaced by 'bus' because majority of people in Northern Sri Lanka are unfamiliar with train and bus is the most common public travel mode. Similarly, 'watch' was replaced with 'balance' because among older adults only a few use a watch and a weighing balance is a common measuring item people are likely to have experienced in their life.

The MoCA interviewer guide which has comprehensive instructions for administration of MoCA was also translated to Tamil. Necessary changes were made in MoCA - Tamil (Sri Lanka) adaptation. Then the translated guide was reviewed by a panel of experts who were involved in the translation into MoCA - Tamil (Sri Lanka) of the original MoCA tool. The adopted tool and guide were pretested among 10 patients from a medical clinic for chronic diseases at Teaching Hospital Jaffna and few corrections were made.

Clinical diagnosis were made among older adults attending the Neurology Clinic of Teaching Hospital

Jaffna, who were subjected to full physical and neurological examination by a neurologist to classify them as having normal cognition or having MCI. Those deemed as having normal cognition were without any cognitive complaint or impairment on assessment and did not have dementia by the Diagnostic and Statistical Manual of Mental Disorders fourth edition (DSM-IV) criteria nor MCI. Those deemed as having MCI were classified, so that based on the criteria, e.g., the presence of memory complaint (corroborated by an informant), impaired memory function for age and education (delayed word recall score < 1 SD below normal age- and education-matched mean for Sri Lankan older adults), intact activities of daily living and no dementia with DSM-IV criteria.¹⁰ Every willing older adult (n = 184; classified as either having normal cognition or having MCI) then underwent a detailed clinical and cognitive assessment, lasting for approximately 90 minutes. The results of the gold standard were blinded to the MoCA - Tamil (Sri Lanka) administration. Socio-demographic data, history on cognitive symptoms and coexisting diseases were collected and the MoCA - Tamil (Sri Lanka) was administered. Then after 4 weeks a total of 20 older adults (10 with normal cognition and 10 with MCI) randomly selected from the 184 study participants, were assessed for test - retest reliability of the MoCA by the same data collector. The study also evaluated inter-rater reliability (IRR) by inviting another subgroup of 20 participants (10 with normal cognition and 10 with MCI), who were rated twice by two independent raters with the MoCA - Tamil (Sri Lanka).

Statistical analysis were performed based on the suggestion of original MoCA tool developers. An additional point was added to persons with 12 years of

education or less to correct for education effects. Therefore, in this study, an additional point was added to MoCA - Tamil (Sri Lanka) scores for those who had education 12 years or less (if MoCA - Tamil (Sri Lanka) score < 30). Demographic characteristics across those with normal cognition and MCI were compared using the chi-squared test (for categorical variables) or the student t-test (for continuous variables). Internal consistency reliability of the MoCA - Tamil (Sri Lanka) was assessed using Cronbach's alpha. Test-retest reliability of the MoCA - Tamil (Sri Lanka) was assessed using intra-class correlation coefficients (ICCs) for baseline and four weeks retest scores. ROC curve analysis was performed to determine sensitivity and specificity for detecting MCI. All tests considered two-sided hypotheses and a 5% level of significance.

Results

Study participants were 184 older adults, comprising 85 with normal cognition and 99 neurologist-diagnosed MCI. The mean age was 69.7 (SD 4.8) years. There was no statistical significant difference in the mean age or sex between normal cognitive and MCI participants, but a significant difference was observed in years of education between the two categories of participants (Table 1).

Table 2 shows the education-adjusted mean MoCA-Tamil (Sri Lanka) scores of normal cognitive and MCI participants. The mean MoCA - Tamil (Sri Lanka) score discriminated the two diagnostic categories of the study participants (p-value < 0.001).

Test – retest reliability data were collected from a subsample of 20 participants (normal cognition and MCI) tested, on average, 28 ± 1.5 days apart. The mean change in MoCA - Tamil (Sri Lanka) scores from the first

Table 1. Demographic Characteristics of the Study Participants by Cognitive Status (N=184)

Demographic Characteristics	Normal Cognition	MCI	p-value
Age, in years; Mean (SD)	69.1 (± 4.5)	70.2 (± 5.0)	p# = 0.12
Years of education; Mean (SD)	9.2 (±2.7)	8.1 (±2.9)	p# = 0.01
Male (%)	41 (48.2)	52 (52.5)	p* = 0.56
Female (%)	44 (51.8)	47 (47.5)	

Notes: p# = p-value derived by student t-test, p* = p-value derived by chi-square test
MCI = Mild Cognitive Impairment

Table 2. Summary of Group Differences of MoCA - Tamil (Sri Lanka) Scores

Cognitive Status	MoCA - Tamil (Sri Lanka) Score			
	Mean Score (95% CI)	Median	Interquartile Range	Skewness
Normal cognition (N = 85)	26.4 (26.0 – 26.8)	26.0	25 – 28	0.30
MCI (N = 99)	21.2 (20.7 – 21.7)	21.0	19 – 23	-0.09
p-value	< 0.01			

Notes: MoCA = Montreal Cognitive Assessment, MCI = Mild Cognitive Impairment, CI = Confidence Interval

to second evaluation was 0.8 ± 1.8 points, and the correlation between the two evaluations was high (correlation coefficient = 0.93, p-value < 0.001) and suggesting good stability over time and no significant changes with time.

Internal consistency of the scale was assessed using Cronbach's alpha. An alpha value of 0.7 - 0.9 was considered as evidence to support good internal consistency of the instrument.¹¹ The internal consistency of the MoCA - Tamil (Sri Lanka) was moderate to high, yielding a Cronbach's alpha of 0.831. This indicated good internal consistency.

The inter-observer reliability was assessed through the application of the test on the first ten patients in the study by two independent blinded evaluators. A correlation of coefficient of 0.91 was obtained with a 95% CI of (0.77, 0.99). This correlation coefficient is considered almost perfect.

According to Table 3, which shows item test statistics, "The Correlated Item - Total Correlations" are basically correlation between the particular item and a composite score of all the other remaining items. In addition, if the

corrected item-total correlation is > 0.30, it indicates homogeneity between each item and total inventory score. Values < 0.30 indicate that a particular item correlates poorly with the overall scale.¹³ In this tool, all the items except "Naming" have higher than expected corrected item- total correlation. The "Cronbach's alpha if item removed" is a measure of examining the relationship between the individual item and the total scale. This is the value of Cronbach's alpha for the remaining items if the given item is not included in the scale. So in this scale all the subscales' "Cronbach's alpha if item removed" are lower than overall scale's Cronbach's alpha (0.831).

With the use of a cut-off of 26 points (suggested in the literature as the ideal MoCA cut-off score to detect MCI), the MoCA - Tamil (Sri Lanka) detected 90.6% of MCI cases, but specificity was reduced to 44.7% (Table 4). With the use of the cut-off of 24 points, the MoCA-Tamil (Sri Lanka) exhibited high sensitivity (84.7%) and specificity (76.4%). Therefore, 24 points seemed to provide the best balance between sensitivity and specificity (any score of ≤ 23 was considered to be the

Table 3. Internal Consistency Analysis of MoCA - Tamil (Sri Lanka)

Category	Scale Mean if Item Deleted	Correlated Item-Total Correlation	Cronbach's Alpha if Item Removed
Trail making	19.130	0.525	0.782
Copy cube	19.254	0.404	0.790
Clock drawing	17.515	0.688	0.751
Naming	16.587	0.214	0.798
Digit span	18.268	0.560	0.773
Sustained attention	18.884	0.659	0.774
Serial 7 calculation	17.333	0.551	0.770
Sentence repetition	18.395	0.442	0.784
Phonemic fluency	19.337	0.325	0.794
Abstraction	17.891	0.575	0.774
Delayed recall	17.362	0.378	0.819
Orientation	14.225	0.563	0.769
Overall scale statistics	19.471		0.831

Note: MoCA = Montreal Cognitive Assessment

Table 4. Sensitivity, Specificity, Positive Predictive Value and Negative Predictive Value of the MoCA - Tamil (Sri Lanka) for Detection of Normal Cognitive and Mild Cognitive Impairment Patients

Cutoff	Sensitivity	Specificity	PPV (%)	NPV (%)
≥ 21	52.4	100.0	100.0	48.32
≥ 22	58.6	100.0	100.0	51.80
≥ 23	68.1	97.6	98.45	57.60
$\geq 24^*$	84.7	76.4	88.90	68.40
≥ 25	87.7	64.7	84.80	70.00
≥ 26	90.6	44.7	78.60	67.9
≥ 27	94.8	28.2	76.70	70.79
≥ 28	97.4	16.5	72.38	73.85
≥ 29	100.0	7.1	58.30	100.00
≥ 30	100.0	0.0	69.2	Not applicable

Notes: *values indicate cut-off point used in the study with values of sensitivity and specificity; PPV: positive predictive value; NPV: negative predictive value

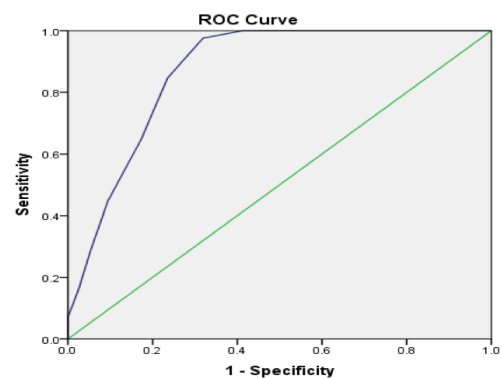


Figure 1. Receiver Operating Characteristic (ROC) Curve Analysis of MoCA - Tamil (Sri Lanka) for the Detection of Normal Cognitive and MCI Patients

abnormal result).

The area under the ROC curve (AUC) of the MoCA - Tamil (Sri Lanka) for the identification of MCI was 0.87 (95% CI = 0.83 - 0.91) (Figure 1). It denotes that the cut-off of 24 points has good ability to diagnose patients with and without MCI based on the test.

Discussion

The objective of this study was to develop the Tamil (Sri Lanka) version of the MoCA and investigate its reliability and validity as a brief screening tool for MCI among Tamil - speaking Sri Lankan older adults. In South Asia, Sri Lanka is prominent as a society with a rapidly ageing population. The validation of MoCA in Tamil (Sri Lanka) will be very useful for the clinicians and especially for the primary care physicians in detecting MCI thus enhance the provision of appropriate care in time.

The results of this study seemed to be in line with previous validation studies using the MoCA. Firstly, the MoCA - Tamil (Sri Lanka) mean scores for the diagnostic groups were similar to the ones presented in the original study.² Second, the MoCA - Tamil (Sri Lanka) demonstrated adequate test-retest reliability and high internal consistency and these were similar to the studies of MoCA validation by several authors.^{2,5,12,13}

As shown in Table 3, "Cronbach's alpha if item removed" is a measure of examining the relationship between individual item and the total scale. This is the value of Cronbach's alpha for the remaining items if the given item is not included in the scale. Hence, in this scale, all the subscales "Cronbach's alpha if item removed" are lower than overall scale's Cronbach's alpha (0.831). It means all the items are needed for the scale in terms of reliability. Karunaratne, *et al.*,⁵ found that Cronbach's alpha increased when the item naming was removed and they concluded that the contribution of the item 'Naming' to the scale was poor.

Sensitivity and specificity of a tool were determined based on the cutoff point decided with the help of ROC curve. A score which yields the best balance between sensitivity and specificity for the MCI participants was decided as the cutoff score. As described in Table 4 the cut-off score of ≥ 24 discriminate normal cognitive (NC) from MCI participants with the sensitivity of 84.7% and specificity of 76.4%. This cut-off score provides the positive predictive value (PPV) as 88.9% and negative predictive value (NPV) of 68.4%. When increasing the cut-off value to 26 as recommended by the authors of original MoCA tool the sensitivity increased to 90.6% but specificity decreased to 44.7%. Because of this reason, it was decided that a score of ≥ 24 was the cut-off value to detect NC from the MCI participants.

The Spanish version of MoCA validation used scores

of ≥ 23 with the optimal sensitivity (89%) and specificity (79.8%).¹² In the Beijing version of Chinese MoCA validation, the cut-off score for the optimal sensitivity and specificity to detect MCI appeared to be ≥ 22 in the assessment for MoCA - Beijing, at which the sensitivity and specificity were 68.7% and 63.9% respectively.¹³

Some limitations of this study should be mentioned. This tool cannot be applied to illiterate elders, therefore, they were excluded from the study. Another limitation is the fact that the MCI group was heterogeneous, as different MCI subtypes were included in the sample. In addition, this was not a community study, as the sample was hospital based.

Conclusion

Validated Tamil (Sri Lanka) MoCA is a reliable and an acceptable tool to assess MCI in the primary care settings with a cut-off value of ≥ 24 . It has 84.7% sensitivity and 76.4% Specificity. The reliability and internal consistency of the tool are higher than the expected level. Further studies need in community settings to use this instrument in the community.

Abbreviations

MCI: Mild cognitive impairment; AD: Alzheimer's disease; MoCA: Montreal Cognitive Assessment; MMSE: Mini-Mental State Examination; IRB: Institutional Review Board; DSM-IV: Diagnostic and Statistical Manual of Mental Disorders fourth edition; IRR: Inter-rater Reliability; ICCs: Intra-class Correlation Coefficients; AUC: Area Under the ROC Curve; NC: Normal Cognitive; PPV: Positive Predictive Value; NPV: Negative Predictive Value; ROC: Receiver Operating Characteristic.

Ethics Approval and Consent to Participate

Approval of the research protocol from the Institutional Review Board (IRB) at the University of Jaffna was obtained (Ref.No: J/ERC/13/42/DR/0010). Written informed consent was obtained from all participants.

Competing Interest

Authors declare that there is no significant competing interests under financial, general, and institutional purview.

Availability of Data and Materials

Materials described in the manuscript, including all relevant raw data, will be freely available to any scientist wishing to use them for non-commercial purposes, without breaching participant confidentiality.

Authors' Contribution

P A D Coonghe and P Fonseka conceived of the presented idea. P A D Coonghe, S Sivayokan and A Kesavaraja developed the theory and performed the field studies. R Maholtra and T Ostbye verified the analytical methods. P Fonseka and T Ostbye encouraged P A D Coonghe and supervised the findings of this work. All authors discussed the results

and contributed to the final manuscript.

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Additional Information

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References

1. Folstein MF, Folstein SE, Mchugh PR. "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research*. 1975 [cited 2017 Jul 14]; 12 (3): 189–98.
2. Nasreddine ZS, Phillips N a., Bédirian V, Charbonneau S, Whitehead V, Collin I, et al. The Montreal Cognitive Assessment, MoCA: a brief screening tool for mild cognitive impairment. *Journal of American Geriatrics Society*. 2005; 53 (4): 695–9.
3. Lee J-Y, Dong Woo Lee, Cho S-J, Na DL, Hong Jin Jeon, Kim S-K, et al. Brief screening for mild cognitive impairment in elderly outpatient clinic: validation of the Korean version of the Montreal Cognitive Assessment. *Journal of Geriatric Psychiatry and Neurology*. 2008; 21(2): 104–10.
4. Yeung PY, Wong LL, Chan CC, Leung JLM, Yung CY. A validation study of the Hong Kong version of Montreal Cognitive Assessment (HK-MoCA) in Chinese older adults in Hong Kong. *Hong Kong Medical Journal*. 2014; 20 (6): 504–10.
5. Karunaratne S, Hanwella R, De Silva V. Validation of the Sinhala version of the Montreal Cognitive Assessment in screening for dementia. *Ceylon Medical Journal*. 2011; 56 (4): 147-53.
6. Department of Census and Statistics. *Census of population and housing 2012*. Sri Lanka: Ministry of Finance and Planning; 2012.
7. Eberhard, David M., Gary F. Simons, and Charles D. Fennig (eds.). *Ethnologue: languages of the world*. Twenty-third edition. Dallas, Texas: SIL International; 2020.
8. United Nations Educational, Scientific and Cultural Organization. *UNESCO country programming document for Sri Lanka, 2013-2017*. India: New Delhi Office; 2013 [cited 2017 Jul 25].
9. The American Psychiatry Association. *Diagnostic and statistical manual of mental disorders, 4th edition, text revision (DSM-IV-TR)*. Washington, D.C.: American Psychiatric Association; 2000.
10. Streiner DL. A checklist for evaluating the usefulness of rating scales. *The Canadian Journal of Psychiatry*. 1993 Mar [cited 2015 Apr 30]; 38 (2): 140–8.
11. Abdollahimohammad A, Ja'afar R. Learning style scales: a valid and reliable questionnaire. *Journal of Educational Evaluation for Health Professions*. 2014 Jan [cited 2015 Mar 28]; 11: 22.
12. Gil L, Vega JG, Ruiz de Sanchez C, Burgos FP. Validation of the Montreal Cognitive Assessment – Spanish version test (MoCA-S) as a screening tool for mild cognitive impairment and mild dementia in Bogotá, Colombia. *Alzheimer's & Dementia*. 2013; 9 (4): 452–3.
13. Yu J, Li J, Huang X. The Beijing version of the montreal cognitive assessment as a brief screening tool for mild cognitive impairment: a community-based study. *BMC Psychiatry*. 2012; 12: 156.