Translation and Cross-Cultural Adaptation of Nepali Version of the Montreal Cognitive Assessment

Manju Gyawali,[1] Jarugool Tretriluxana,[1] Pakaratee Chaiyawat,[1] Chutima Jalayondeja,[1] Bishwas Shrestha,[2]

[1]Faculty of Physical Therapy, Mahidol University, Thailand, [2]Nepal Mediciti Hospital, Lalitpur, Nepal.

ABSTRACT

Background: Montreal Cognitive Assessment is widely used in stroke to detect cognitive impairment. The superiority of it over other outcome measures has been well established. It has been cross-culturally translated and has shown excellent psychometric properties. To assess the intervention effect on cognition of Nepalese individuals with stroke using the Montreal Cognitive Assessment, an adapted Nepali version is required as the Nepalese cultural context and language are completely different than the original was developed. Thus, the objective of this study is to translate and cross-culturally adapt Montreal Cognitive Assessment in the Nepali language and see its test-retest reliability and internal consistency.

Methods: After translating and cross-culturally adapting the Montreal Cognitive Assessment into Nepali using Beaton guidelines. Its Nepali version was administered to 28 individuals with stroke twice keeping the interval of two weeks. Test-retest reliability and internal consistency were assessed using the Intraclass correlation coefficient and Cronbach's alpha.

Results: The Montreal Cognitive Assessment was translated into Nepali with significant cultural adaptations and the Nepali version demonstrated excellent psychometric properties as hypothesized. The test-retest reliability and internal Consistency were excellent. The Intraclass correlation coefficient of the total score was 0.990 and Cronbach's alpha value was 0.994 for total scores.

Conclusions: The Nepali version of Montreal Cognitive Assessment is reliable to use as a diagnostic tool for detecting cognitive impairment in patients with stroke. It is comprehensive, easy to administer and culturally appropriate.

Keywords: Cognition; montreal cognitive assessment (MoCA); outcome measure; reliability; stroke

INTRODUCTION

Stroke leads to cognitive deficit along with physical deficit.[1-3] Among different cognitive assessment tools Montreal Cognitive Assessment (MoCA) is easy for screening mild cognitive impairment and its executive sub score is the strongest predictor of functional status. MoCA has been cross culturally translated in many languages.[4-8]

Outcome measures are standard tools for evaluating health status. MoCA was originally developed in English, which is a global language, but the Nepalese cultural context and language are completely different. To assess the intervention effect on the cognition of Nepalese individuals using MoCA, an adapted Nepali version is required and must be adapted culturally to maintain content validity at a conceptual level and consistency to use in new culture. There was no evidence of MoCA adapted in Nepali. Therefore, we aimed to translate the original MoCA cross-culturally into the Nepali language and establish test re-test reliability and internal consistency of the translated version in stroke.[9-10]

METHODS

The conduct and reporting of this research was guided by the guidelines proposed by Beaton and colleagues in 2000 for the process of cross-cultural adaptation.[11]

A purposive sampling technique was used. Potential subjects were recruited from Nepal Mediciti Hospital, Sainbu, Nepal. To be eligible to participate in the study, participants were required to be 1) Age between 18 and above as stroke can be seen in this age group 2) Both male and female 3) Both hemorrhagic and ischemic

Correspondence: Jarugool Tretriluxana, Mahidol University, Thailand. Phone: +66 2 441 5450. Email: Jarugool.tre@mahidol.ac.th.

stroke patients 4) Able to understand the instruction 5) Able to read and write the Nepali language 6) No cognitive impairment assessed by MMSE. Exclusion criteria include 1) Stroke patients with premorbid cognitive impairment 2) Stroke with other neurological conditions like Parkinson's. This patient was excluded as we don't want pre-stroke cognitive decline individuals as it may act as a confounding factor in our study.

We recruited 28 individuals who met the criteria of participation selection. We recruited participants between August to December 2021.

The study was conducted in two phases: Phase 1 - the translation and cross-cultural adaptation of MoCA to Nepali, including the pre-testing of the translated Nepali version and Phase 2 – investigation of the psychometric properties of MoCA that is test retest reliability and internal consistency.

Phase 1- The translation and cross-cultural adaptation process included the following steps:

Forward Translation: Four translators, two from a medical background (FT1 and FT2: working as a physiotherapist) and two other from non-medical background (FT3: professional translator and FT4: school teacher) was chosen. They independently translated the English version of MoCA into Nepali. The translators chosen were bilingual with their mother tongue being Nepali. FT1 and FT2 were aware of the concepts being examined in the outcome measure, while FT3 and FT4 were not informed about the concepts of outcome measure. FT1 and FT2 were Masters of Physical Therapy who had at least 5 years of experience working with stroke cases.

Synthesis: A consensus meeting was held between the researchers and 4 translators and a common synthesis was produced (FT1234)

Backward Translation: Two backward translators were chosen BT1 and BT2. This is a process of validity checking to make sure that the translated version effects the same item content as the original version. This step often magnifies unclear wording in the translation.

Expert Committee Review: The expert committee was formed which included group of a forward translators, a group of backward translators and a Neurologist. The expert committee discussed and sorted out discrepancies between the source and target version in all four areas; semantic equivalence, idiomatic equivalence, experimental equivalence, conceptual equivalence and the pre-final version of the MoCA was prepared.

Testing of the pre-final version of the questionnaire: Pre-final Nepali version of the MoCA were tested on 4 individuals. The participants was asked to complete the questionnaire and were additionally interviewed with open questions to find the difference between the meaning of items and their actual responses. In response to participant's feedback, minor corrections were made to improve the sentence structure of the instructions to make it easier for the participants to understand, and the final Nepali versions of MoCA were produced.

Submission: Submission of all the reports and forms to the developer of the instrument and coordinating Committee for appraisal was done.

Phase 2- Reliability testing: The participants were screened according to selection criteria. The participants were explained about the purpose, risks and benefits of the study. Informed written consent was taken from all participants. The demographic data of participants including the education level of the participant were recorded. Then, the participants were asked to complete the Nepali version of the MoCA. The caregivers and the researchers provided assistance to a few participants in filling up the questionnaire when they had difficulties writing owing to limited hand function. They were not explaining the items or assist in choosing an answer. The Nepali version of MoCA was administered two times keeping the interval of two weeks.[12] The completed questionnaire was checked to ensure that there is no missing data. Appropriate time was provided to the participants to avoid an increase in fatigue which may have an influence on the participant's answer.

The study protocol was approved by the Institutional Review Board of Mahidol University, Thailand, and Nepal Health Research Council, Nepal. Every participant provided a written informed consent prior to the start of the study. In the event participants were unable to sign the consent form themselves, a witness signed for them.

Statistical analysis was performed using SPSS (IBM SPSS Statistics Version 23, Chicago, IL, USA). Descriptive statistics was used for the demographic data and MoCA scores. The level of significance was 0.05. Normal distribution was assessed using Kolmogorov and Smirnov test.[13]

Test-retest reliability was determined using the intra-class correlation coefficient (ICC 3,1) between the initial and follow-up. The test re-test reliability was examined on the item level and domain level. Scores of < 0.50 were considered poor correlation, 0.50-0.75 will be moderate, 0.75- 0.90 good and > 0.75 excellent. We

hypothesized that the test-retest reliability would be moderate to excellent for the Nepali version of MoCA i.e. 0.50- >0.90.

Internal consistency was analyzed using Cronbach's alpha (α). Scores between 0.50 and 0.69 were considered poor, 0.70 and 0.79 acceptable, 0.80 and 0.89 good and > 0.90 excellent. We hypothesized that there will be moderate to the excellent internal consistency of the Nepali version of MoCA i.e. 0.70- >0.90.

RESULTS

Phase 1. Translation and cross-cultural adaptation

A preliminary version of the Nepali version of MoCA was pre-tested among 2 male and 2 female stroke patients. The mean age was 43.25 ± 13.57 years ranging from 27-59 years, (age: 48, 39, 27, 59). Among 4 participants, three participants had MCA stroke and one participant had ACA. Two participants were educated up to a higher secondary level, and two participants had a bachelor's degree. During the testing, the respondents reported that the questionnaire was comprehensible.

Word like church and daisy underwent the adjustment process and changed to temple and rose to facilitate the understanding to stroke patient as these 2 words (church and daisy) is not a common word for all the Nepalese population. The respondents highlighted the items which were not feasible in the Nepali context and also recommended common terminologies.

After the expert committee meeting, several items were adjusted to achieve the equivalence between the original MoCA and the Nepali version of MoCA. In the component of attention "read list of letter, like F was adjusted to Fa, M to Ma, N to Na, and L to La. Even the single letter of A-B-C-D-E were adjusted to double letter like KA-KHA-GA-GHA-NA in the subcomponent of visuospatial/executive function.

Phase 2. Reliability of the Nepali version of MoCA (NMoCA)

28 participants met the eligibility criteria and were recruited to assess the reliability of the Nepali version of MoCA. Out of total patients 50 percent were male and the other 50 percent were female (14 males - 14 females). Out of total stroke patients mean age +_SD was 51.29+-13.126 years with range from 29-76 years and 78.6 % were ischemic stroke and 21.4 % were hemorrhagic stroke. Majority of participants had sub-acute stroke (85.7 % had sub-acute stroke) with a mean duration

of injury of 2.0714+_.37796 Months. 57.1 % of patients were educated more than 12. The characteristics of the participants are displayed in Table 1

Table 1. Demographics characteristics of the participants (mean ± standard deviation).						
	Valid		Cases Missing		Total	
	N	Percent	N	Percent	N	Percent
MOCA Scoring 1st Evaluation	28	100%	0	0%	28	100%
MOCA Scoring 2nd Evaluation	28	100%	0	0%	28	100%
Characteristics / Variables			Total Sample (n=572)			
Age			51.29 ±13.126			
Sex (M/F)			14/14			
Marital Status, Married n (%)			28 (100)			
Types of Stroke, n (%)						
Ischemic			6 (21.4)			
Haemorrhagic			22 (78.6)			
Date of Stroke, n (%)						
Acute			2 (7.1)			
Sub-acute			24 (85.7)			
Chronic			2 (7.1)			
Educational Level, n (%)						
< Bachelor			12 (42.8)			
Bachelor			10 (35.7)			
Master			6 (21.45)			

MoCA scores

The frequency distribution of the total MoCA showed it was normally distributed as shown in Table 2. The participants demonstrated the highest score in the naming sub-scale indicating that they were familiar with the animals.

Table 2. Normality testing.						
	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	Df	Sig	Statistic	Df	Sig
MOCA scoring 1st evaluation	.152	28	.098	.962	28	.381
MOCA scoring 2nd evaluation	.147	28	.127	.954	28	.246

We tested Normality by Kolmogorov-Smirnov and Shapiro-wilk test and the result showed normally distributed as the p-value was more than 0.05.

Table 3. Test-retest and internal consistency of NMoCA [means ± standard deviation, (range)].		
	MoCA 1	MoCA 2
Visuospatial	3.14 ± 1.14 (1-4)	3.04 ± 1.20 (1-4)
Naming	2.93 ± 0.27 (2-3)	2.93 ± 0.27 (2-3)
Attention	4.36 ± 1.22 (1-6)	4.64 ± 1.25 (1-6)
Language	2.32 ± 0.86 (0-3)	2.36 ± 0.78 (0-3)
Delayed recall	3.82 ± 0.90 (3-5)	3.93 ± 0.94 (3-5)
Orientation	5.07 ± 0.77 (4-6)	5.14 ± 0.76 (4-6)
MoCA Total Score	23.29 ± 4.23 ( )	23.83 ± 4.18 ( )

Reliability Statistics (Cronbach's Alpha): 0.99

Test-retest reliability (Intraclass Correlation Coefficient (ICC)): 0.99, p <= 0.001

Test-retest reliability of MoCA was tested using Intraclass Correlation Coefficient (ICC) and the Nepali version of MoCA showed excellent test-retest reliability for total scores, with an ICC of 0.99 (p=0.00), which is close to 1 Margin of error (p=0.5). Internal consistency of MoCA: The Cronbach's α coefficients for the total score was 0.994.

DISCUSSION

According to participant reports, the Nepali version of MoCA was comprehensible. However, to ensure that the translation was culturally appropriate and valid, we followed the recommended international Beaton guideline for cross-cultural adaptations during the translation of the English version of MoCA into Nepali.[14] We also conducted interviews with participants, held expert committee discussions, and obtained feedback from the questionnaire developer to gain valuable insights that were used to develop the final version of the questionnaire. Detailed written report has also been prepared on each step including discrepancies found and the ways they were solved. The consensus between translators was reached without compromising any of their feelings.

It should be noted that a direct translation of an outcome measure from one language or culture to another may not result in a valid instrument. Therefore, our approach to adapting and translating the MoCA into Nepali was essential in ensuring the validity of the questionnaire for use in the Nepali cultural context. This study provides compelling evidence for the necessity of cross-cultural adaptation when translating a measure into a target language.[15] The MoCA has been successfully translated and validated in various countries, with and

without modifications to the content. In our study, we undertook minor adaptations that were relevant to the Nepali community, and successfully translated the MoCA. However, during the forward translation and synthesis, we encountered variations in language in several subcomponents. Forward translators provided strong inputs at times of difficulty in finding exact and/or inappropriate Nepali words. This finding may be related to the fact that Nepal has different castes and languages spoken throughout the country,[16] which may influence the way in which individuals understand and interpret the questionnaire.

This language differences were noted, discussed and resolved at the meeting of expert committee. Some adjustment was done during expert committee meeting like in the subcomponent of visuospatial/executive, the single letter of A-B-C-D-E were adjusted to double letter like KA-KHA-GA-GHA-NA. In the section of attention "read list of letters, like F was adjusted to Fa, M to Ma, N to Na, and L to La. In the forward translation and synthesis phase, we discovered that the words "church" and "daisy" were not familiar to Nepalese people. Therefore, we made the decision to translate "church" to "temple" and "daisy" to "rose" in the Nepali version of the MoCA. During the pre-testing phase, we conducted interviews with individuals who had suffered from stroke and asked for their preferences among the proposed options. Interestingly, none of the participants choose the Nepali translation of "of church and daisy", and furthermore, they had never even heard of the word "daisy". As a result, we decided to omit "daisy" from the final Nepali translation of the MoCA.

Reliability of the Nepali version of MoCA:

This study checked the reliability of the Nepali version of MoCA among the stroke population of Nepal. The hypothesis of the study was the test-retest reliability would be at a moderate to excellent level with ICC ranging from 0.50-0.90. The test-retest reliability was excellent. The ICC of the total score was 0.990. The ICC of total scores of MoCA were similar to Indian Version of MoCA and Hiligaynon version of MoCA.[17] The Indian version of MoCA has high test retest reliability. The ICC was 0.87. The Hiligaynon Version of MoCA showed an acceptable test-retest reliability. The ICC was 0.74. The hypothesis of the study was the internal consistency of NMoCA would be moderate to excellent i.e. 0.70- >0.90. The result showed that the Cronbach's α value was 0.994 for total scores. We found the Internal Consistency of Nepali version of MoCA to be excellent. The Indian version of MoCA demonstrated internal consistency with a Cronbach's alpha coefficient of 0.64, while the Thai

version of MoCA demonstrated even higher internal consistency with a Cronbach's alpha coefficient of 0.914.[17-18] Our study provided evidence supporting the utility of MoCA as a useful tool for detecting cognitive impairment in Nepalese stroke patients.

We translated MoCA into Nepali with significant cultural adaptations and that the Nepali MoCA demonstrated excellent psychometric properties as hypothesized on heterogeneous participants.

The limitations of this study were that only individuals with stroke were recruited. Therefore, the result might not be generalized to other conditions. The Nepali version of the MoCA is not applicable to the stroke population who cannot read the Nepali language.

We suggest that additional research be conducted to examine the validity and other psychometric properties of the NMoCA, as well as its minimal detectable change and minimal clinically important change. Furthermore, we recommend exploring the psychometric properties of the NMoCA in populations beyond stroke patients, such as the elderly, individuals with traumatic brain injury, and those with Parkinson's disease

CONCLUSIONS

The Nepali version of MoCA is a reliable tool for detecting mild cognitive impairment in patients with stroke. It is comprehensive, easy to administer and culturally appropriate to use in variety of clinical settings. It can also be used for research purpose in Nepal.

ACKNOWLEDGEMENTS

CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

1. Douiri A, Rudd AG, Wolfe CD. Prevalence of poststroke cognitive impairment: South London Stroke Register 1995-2010. Stroke. 2013;44(1):138-145. doi:10.1161/strokeaha.112.670844

2. Jacquin A, Binquet C, Rouaud O, Graule-Petot A, Daubail B, Osseby GV, et al. Post-stroke cognitive impairment: high prevalence and determining factors in a cohort of mild stroke. Journal of Alzheimer's Disease. 2014 Jan 1;40(4):1029-38.doi:10.3233/jad-131580

3. Tatemichi TK, Desmond DW, Stern Y, Paik M, Sano M, Bagiella E. Cognitive impairment after stroke: frequency, patterns, and relationship to functional abilities. J Neurol Neurosurg Psychiatry. 1994;57(2):202-207. doi:10.1136/jnnp.57.2.202

4. Nasreddine ZS, Phillips NA, Bédirian V, Charbonneau S, Whitehead V, Collin I, et al. The Montreal Cognitive Assessment, MoCA: a brief screening tool for mild cognitive impairment [published correction appears in J Am Geriatr Soc. 2019 Sep;67(9):1991]. J Am Geriatr Soc. 2005;53(4):695-699. doi:10.1111/j.1532-5415.2005.53221

5. Memória CM, Yassuda MS, Nakano EY, Forlenza OV. Brief screening for mild cognitive impairment: validation of the Brazilian version of the Montreal cognitive assessment. Int J Geriatr Psychiatry. 2013;28(1):34-40. doi:10.1002/gps.3787

6. Dong Y, Sharma VK, Chan BP, Venketasubramanian N, Teoh HL, Seet RC, Tanicala S, Chan YH, Chen C. The Montreal Cognitive Assessment (MoCA) is superior to the Mini-Mental State Examination (MMSE) for the detection of vascular cognitive impairment after acute stroke. Journal of the neurological sciences. 2010 Dec 15;299(1-2):15-8. doi:10.1016/j.jns.2010.08.051

7. Pendlebury ST, Cuthbertson FC, Welch SJ, Mehta Z, Rothwell PM. Underestimation of cognitive impairment by Mini-Mental State Examination versus the Montreal Cognitive Assessment in patients with transient ischemic attack and stroke: a population-based study. Stroke. 2010;41(6):1290-1293. doi:10.1161/strokeaha.110.579888

8. Stolwyk RJ, O'Neill MH, McKay AJ, Wong DK. Are cognitive screening tools sensitive and specific enough for use after stroke? A systematic literature review. Stroke. 2014;45(10):3129-3134. doi:10.1161/strokeaha.114.004232

9. Julayanont P, Brousseau M, Chertkow H, Phillips N, Nasreddine ZS. Montreal Cognitive Assessment Memory Index Score (MoCA-MIS) as a predictor of conversion from mild cognitive impairment to Alzheimer's disease. J Am Geriatr Soc. 2014;62(4):679-684. doi:10.1111/jgs.12742

10. Chiti G, Pantoni L. Use of Montreal Cognitive Assessment in patients with stroke. Stroke. 2014;45(10):3135-3140. doi:10.1161/strokeaha.114.004590

11. Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. Spine (Phila Pa 1976). 2000;25(24):3186-3191. doi:10.1097/00007632-200012150-00014

12. Portney LG, Watkins MP. Foundations of clinical research: applications to practice: Pearson/Prentice Hall Upper Saddle River, NJ; 2009.

13. Cronbach LJ, Warrington WG. Time-limit tests: estimating their reliability and degree of speeding. Psychometrika. 1951;16(2):167-188. doi:10.1007/bf02289113

14. Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. Spine (Phila Pa 1976). 2000;25(24):3186-3191. doi:10.1097/00007632-200012150-00014

15. Sharma S, Pathak A, Jensen MP. Words that describe chronic musculoskeletal pain: implications for assessing pain quality across cultures. J Pain Res. 2016;9:1057-1066. Published 2016 Nov 16. doi:10.2147/JPR.S119212

16. Kathmandu NJP. Central Bureau of Statistics. 2014;33:34.0.

17. Aliling NB, Rivera AS, Jamora RDG. Translation, Cultural Adaptation, and Validation of the Hiligaynon Montreal Cognitive Assessment Tool (MoCA-Hil) Among Patients With X-Linked Dystonia Parkinsonism (XDP) [published correction appears in Front Neurol. 2020 Sep 02;11:947]. Front Neurol. 2019;10:1249. Published 2019 Nov 28. doi:10.3389/fneur.2019.01249

18. Tangwongchai S, Phanasathit M, Charernboon T, Akkayagorn L, Hemrungrojn S, Phanthumchinda K, Nasreddine Z. The validity of thai version of the montreal cognitive assessment (MoCA-T). Dement Neuropsychol. 2009 Sep;3(2):172.[Google Scholar]