Translation, Cultural Adaptation and Validation of ACE III for Assessment of Cognition for Gujarati Population

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ABSTRACT

Introduction: Cognition is defined as "the mental action or process of acquiring knowledge and understanding through thought, experience, and the senses." It is a method used by Central Nervous System (CNS) to process information. Ageing leads to cognitive decline and timely diagnosis and intervention might help for successful ageing. Addenbrooke's Cognitive examination III (ACE III) is a screening tool to detect dementia and mild cognitive impairment. It assesses different domains of cognition like attention, memory, verbal fluency, language and visuo-spatial abilities. The tool was originally developed in English and later was translated to many other languages like Spanish, Thai, Japanese, Malayalam and Hindi. Gujarati is the official language of the state of Gujarat, India. Out of the total population of Gujarat 8.3% are 60 years and above.

Aim: To translate ACE III to Gujarati language, and also to culturally adapt and validate ACE III for Gujarati population.

Materials and Methods: This methodological study carried out in Ahmedabad Institute of Medical Sciences, Gujarat, India, from November 2016 to May 2017. The ACE III was translated to Gujarati using forward–backward–forward method. The face validity was established by an expert panel consisting of seven neurological medicine and neuro rehabilitation professionals. After obtaining the final Gujarati translated copy of ACE III, both original English version and Gujarati version were administered to group of bilingual older adults to establish the content validity. The data was analysed using Microsoft Excel 2010 and SPSS version 16.0.

Results: The results indicated that there is strong positive correlation between original English version and Gujarati version of ACE III with Pearson's correlation coefficient r=0.87 and p=0.01. The Gujarati version correlated with Education level with Spearman's correlation coefficient r=0.75, p=0.05 and the original English version of ACE III also correlated with Education level of older adults with Spearman's correlation coefficient r=0.75, p=0.05.

Conclusion: The produced Gujarati version of ACE III is equivalent to original English ACE III and can be used to assess cognition in older adults.

INTRODUCTION

Ageing brings anatomical, physiological, psychological and social changes. Though, the anatomical and physiological changes are normal age-related changes, it brings some limitations to the life style of an elderly. Normal age-related changes may come in the form of degeneration of musculo skeletal system, neurological system, cardio pulmonary system, vision and hearing, etc., [1]

Age related degenerative changes to nervous system might cause cognitive decline. As the age advances, there is shrinkage of white and grey matter. Though, the studies showed that the age related cognitive decline is due to neuronal loss or decreased synaptic density, the recent evidences suggest that, the cognitive decline can be due to white matter and myelin disturbances [2].

Cognition is the act or process of knowing, including awareness, reasoning, judgement, intuition, and memory. CNS use cognition to process the information. Knowledge and understanding of the information, awareness, judgement and decision making are the prime components of cognitive processes [1]. The cognition is defined as "the mental action of process of acquiring knowledge and understanding through thought, experience, and the senses" [3].

Cognition can be assessed through standardised and non-standardised methods. Standardised assessments have a documented protocol. The scoring and administration is executed uniformly [4]. There are several standardised tools available for cognitive examination and screening. Addenbrooke's cognitive examination III (ACE III) is one such standardised tool to detect

and monitor cognitive changes in dementia and mild cognitive impairment [5-7]. ACE III includes domains like attention/orientation (18 points), memory (26 points), fluency (14 points), language (26 points) and visuospatial ability (16 points), adding up to a maximum total score of 100 [8]. Higher scores indicate higher levels of cognitive functioning. ACE III has been translated and culturally adapted to various languages [9].

The ACE III is a brief cognitive test that assesses five cognitive domains: attention, memory, verbal fluency, language and visuospatial abilities. The ACE III has replaced ACE –R, and was developed at Neuroscience Research Australia. ACE III has high sensitivity and specificity at cut offs 1.88 (sensitivity 1.0; specificity 0.96) and 2.82 (sensitivity 0.93 and specificity 1.0). Internal reliability is 0.88 [8].

Many languages are spoken in India of which Gujarati is an official language of the state of Gujarat. Out of total population of Gujarat, 8.3% are 60 years and above [10]. Age related cognitive decline can be detected by several tools; however, there are few free tools available in Indian languages for the cognitive assessment [11]. This also explains why studies regarding the prevalence of Mild Cognitive Impairment (MCI) and dementia in Gujarati population are few. The ACE III is translated to other Indian languages like Hindi and Malayalam. Language, social setting (rural or urban), cultural factors such as religion, age and gender are some of the demographic factors which affects performance of cognitive tests [12-14]. Hence, there was a need to translate ACE III to Gujarati. The cognition screening can be carried out optimally if it is well understood by a person undergoing a test. Thus, the aim of the

present study was to translate ACE III to Gujarati and culturally adapt and validate ACE III for Gujarati speaking population. This study is a part of project through which older adults will be assessed and trained for cognitive impairments.

MATERIALS AND METHODS

This methodological study was approved by Institutional Ethics Committee of Ahmedabad Institute of Medical Sciences with ethics approval number AIMS/2016/75. The study was carried out for the period of seven months, from November 2016 to May 2017 at Ahmedabad Institute of Medical Sciences, Gujarat, India and various old age centres at Ahmedabad.

Translation and Cultural Adaptation

The method of translation and cultural adaptation is described in [Table/Fig-1]. The developers and authors of ACE III were approached with the proposal to translate and culturally adapt ACE III to Gujarati. The developers provided the Australian version of ACE III with its scoring guidelines [15]. The ACE III and its components were studied in detailed. The ACE III was then translated to Gujarati by two independent translators who were native speakers of Gujarati language and fluent with English language. As per the guidelines by Rose M et al., the translators were chosen with different background [16]. Out of the two translators, one translator was familiar with the concepts being translated whereas the other was not. The first translator possessed the background of physiotherapy and healthcare, and the other translator had a background of literature and education. The two translations were then reconciled to one as first translation copy. The first translation copy was then studied by the first and the third author and report was prepared by the first author. The report included requirement of changes of certain terminologies and changes in different domains.

[Table/Fig-1]: Method of translation of ACE III to Gujarati.
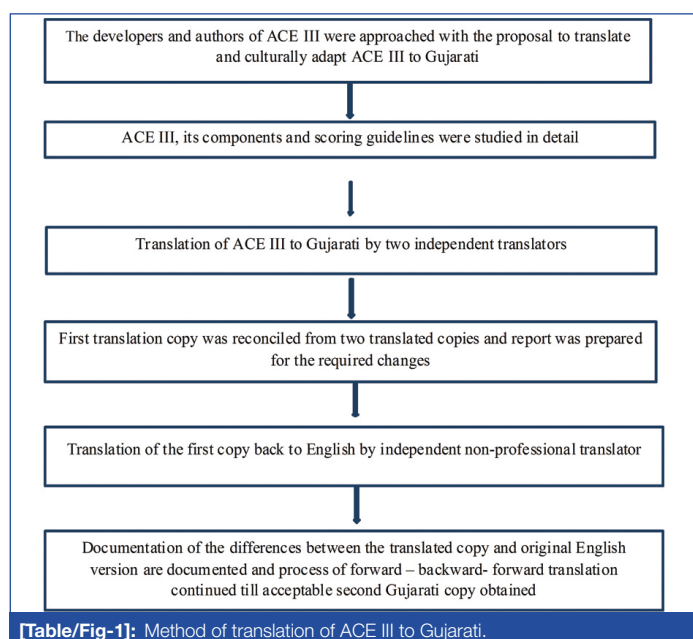
Attention Domain was Retained as it is with Literal Translation into Gujarati

For Fluency domain, "The Letter Task" instructions were modified into relevant Gujarati instructions instead of opting for a literal translation. Words starting from letter "C" like cat, cry, and clock are included as an example in the original English instruction for the letter task. Instead of translating the words of letter "C", different set of Gujarati words starting with same alphabet were used to give example.

Repeating and recalling name and address for memory domain was changed to a Gujarati name and a local address. General knowledge questions for memory domain were changed to relevant questions for Gujarati population.

Language domain of ACE III includes six tasks. Out of which "pencil and paper task" and "repeat the words" were retained as it is with Gujarati translation. In "repeat the proverbs"; the proverbs were changed as per the relevance in Gujarati language. "Name the pictures"; has 12 pictures to be named and 4 questions to be answered based on the pictures. Out of 12, the picture of "kangaroo was changed to cow", "penguin to peacock", "anchor to hammer", "harp to tabla", "barrel to bucket", "crown to bicycle", and "accordion to flute". Rest of the pictures were retained as they were. The questions based on the pictures were changed accordingly. "Read the words" were changed to Gujarati words having same level of difficulty but different meaning.

Visuospatial Ability domain was retained without any changes except "identifying the letters". The letters were changed to Gujarati alphabets having same pronunciation as English letters.

The first copy thus formed, was then translated back to English by an independent non-professional translator who was a bilingual physiotherapist but who was not involved with geriatric, neurology or neuropsychiatric field. As the translator was not aware or informed of the concepts being considered in the translation, it not only prevented information bias but also better prompted, the unexpected meanings of the items in the translated tool. The differences between the translated copy and original English version were documented. The first copy was further modified as per the requirements.

The process of forward-backward-forward translation method continued till the acceptable second copy of Gujarati translation was obtained [17].

Validity

The procedure for the validity of the ACE III is described in [Table/Fig-2]. For the face validity, the second copy of the instrument was given to seven professionals working in neurological medicine and neuro-rehabilitation field with the mean experience of 12 years [18]. Each item was analysed as accepted, accepted with modification or rejected. The report of the items requiring modification was prepared and modified till all the items reached common consensus. None of the items were listed as rejected. The third copy of Gujarati translation was prepared and tested for content validity.

[Table/Fig-2]: ACE III validity.
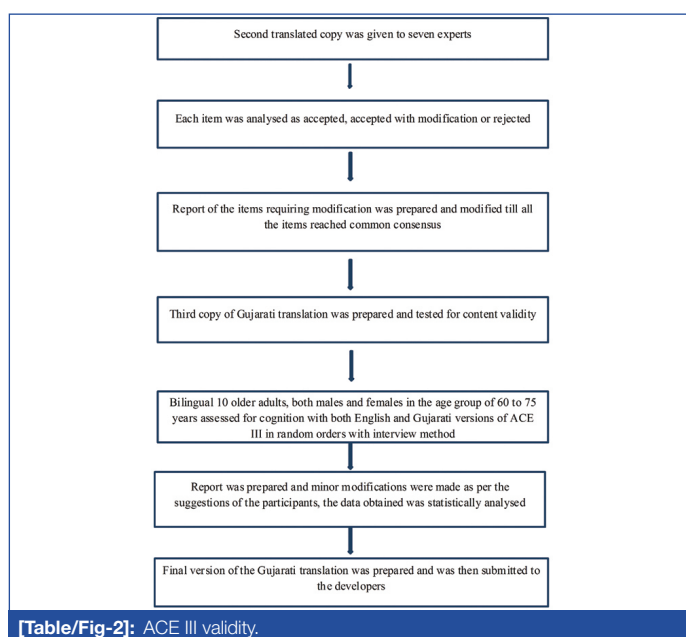
For the content validity, Rose M et al., and Haccoun RR, technique of single group was used. It requires bilingual participants [16,17]. The sample of 10 adults, both males and females in the age group of 60 to 75 years, were selected. They were native speaker of Gujarati and were fluent in English language as well. They were tested and interviewed with both English and Gujarati versions of ACE III in random orders. The subjects were asked if they

understood the components in both the scales equally well or if they felt that there was a need to replace any word or instructions for better understanding. Accordingly, a report was written and minor corrections were made as suggested.

Final Version

After all modifications, the fourth version of the Gujarati translation was prepared. It was thoroughly proof read for any errors. The final version was then submitted to the developers.

STATISTICAL ANALYSIS

The data was analysed using Microsoft Excel 2010 and SPSS version 16.0. The data was analysed for the test of normality by using normal distribution curve and where it was found to be normally distributed, the parametric test was applied and where it was not found to be normally distributed, the non-parametric test was applied.

RESULTS

Face Validity

For face validity, the expert panel consisted of seven professionals working in Neurological medicine and Neuro-rehabilitation Department of Civil Hospital, SBB College of Physiotherapy and Ahmedabad Institute of Medical Sciences, Ahmedabad, Gujarat, India. Their age and experience in years are listed in [Table/Fig-3].

Expert panel serial number	Age (years)	Experience (years)
1	31	8
2	31	8
3	35	12
4	30	7
5	37	12
6	37	17
7	44	20

[Table/Fig-3]: Age and professional experience of expert panel.

The mean±SD age of the older adults who participated in the validation was 67±4.71 years. There were six males and four females. The [Table/Fig-4] shows Pearson's correlation of English and Gujarati version of ACE III. The [Table/Fig-5] shows domain wise results of Gujarati and English ACE III.

Version	Mean±SD	r-value	p-value
Gujarati ACE III	73±13.08	0.87	0.01
English ACE III	57±19.06		

[Table/Fig-4]: Correlation of English and Gujarati version of ACE III.

Domain	Gujarati ACE III (mean±SD)	English ACE III (mean±SD)
Attention	16±1.93	16±1.69
Memory	18.5±5.54	13.8±6.16
Fluency	5±2.98	4.2±3.35
Language	23.2±3.4	12.1±7.01
Visuospatial	11.9±3.38	10.9±3.98

[Table/Fig-5]: Domain wise comparison of English and Gujarati version of ACE III.

The older participants' mean±SD age at the time of completion of their formal education was 20±3.45 years. The [Table/Fig-6] shows Spearman's correlation of level of education with English ACE III and Gujarati ACE III.

Outcomes	r-value	p-value
Education and English ACE III	0.75	0.05
Education and Gujarati ACE III	0.75	0.05

[Table/Fig-6]: Correlation of education with English ACE III and Gujarati ACE III.

DISCUSSION

The purpose of the study was to translate, culturally adapt and validate the Gujarati version of ACE III. Mathurnath PS et al., performed a study to translate ACE to Malayalam and culturally adapt and validate ACE to Malayali speaking population in southern India [14]. Ganguli M et al., performed a study to translate Mini Mental Status Examination (MMSE) to Hindi speaking population in North India [19]. There is a vast cultural difference between different regions of India. So, it requires changes in an English tool to culturally adapt it for Indian population. Also, different language and region prompts for changes unique for that particular culture.

The result indicates that there is a strong positive correlation between the original English version and translated Gujarati version of ACE III. Rose M et al., in their study described that strong correlation between the original tool and the translated version of the tool not only indicates that the quality of the translation is good but also indicates that both the measures provide same information in both the languages [16]. dos Santos Kawata et al., performed a study to validate Japanese Addenbrook's Cognitive examination - Revised (ACE-R) but, they correlated ACE-R with clinical dementia rating having moderate correlation between the said two outcomes [20].

While analysing domain wise results, attention, fluency and visuospatial abilities shows no difference between Gujarati and English versions. But, in memory, subjects have scored more in Gujarati version compared to English version. For Language as well, the subjects scored more in Gujarati version compared to English version. In a previous study of translation of ACE to Malayalam language, the researchers assessed the cognitive level of older individuals residing in Kerala with ACE Malayalam, and older individuals residing in United Kingdom with ACE UK version. In their study, the scores of both the groups were comparable for all the domains [14]. This is contrary to the present study, as in the previous study [14]; the individuals were tested in their place of residence in their spoken language. In the present study, the English version required the subjects living in India, to remember and recall the address which has English name and the areas of Australia, for which most subjects failed. The name and the address were Harry Barnes, 73, Market Street, Rockhampton, Queensland. Compared to this, Gujarati name and address were more relevant and easier to remember and recall.

The language has a component of naming several pictures. The subjects also have to answer the questions based on those pictures. This particular task has maximum score of 12. Many pictures in the English version were not relevant to Gujarati population and that explains why subjects in Gujarat scored less in Language domain in English version.

The correlation of education with English ACE III is 0.75 with p-value 0.05, and correlation with Gujarati ACE III is also 0.75 with p-value 0.05. This indicates strong positive correlation between Gujarati ACE III and level of education. Matias-Guiu JA et al., while translating the ACE III to Spanish had similar findings and also indicated that education exerts significant effect on test scores [21].

The strength of this study is that the translation procedure followed a strict translation and validation protocol described by WHO [22]. The comparative analysis between both the versions was done extensively.

LIMITATION

The limitation of the study is that the average time to execute the Gujarati ACE III was not established as the participants underwent an interview while going through Gujarati ACE III test.

CONCLUSION

This study produced equivalent Gujarati version of ACE III which is comparable and significantly correlating to Original English version of ACE III. Early detection and early intervention can be of great

importance for the individuals with cognitive decline. Gujarati ACE III becomes one of those few tools available for free to detect cognitive impairments. Screenings and differential diagnosis of conditions like MCI, Dementia and Alzheimer's disease can be done easily for Gujarati population with the help of Gujarati ACE III. In future, a study can be carried out to determine an average time to execute the Gujarati ACE III. In addition to this, a study to establish optimal cut off score for Gujarati population and a study to establish intra rater and inter rater reliability can also be carried out. Also, studies to find prevalence of MCI and Dementia in Gujarati population can be conducted.

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REFERENCES

[1] O'Sullivan S, Fulk G, Schmitz T. Physical rehabilitation. 6th ed. Philadelphia: Davis Plus; 2014.

[2] Kohama SG, Rosene DL, Sherman LS. Age-related changes in human and non-human primate white matter: From myelination disturbances to cognitive decline. Age. 2012;34:1093-110. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3448998/

[3] Oxford Dictionaries | Our story, products, technology, and news [Internet]. Oxford Dictionaries. 2017 [cited 30 May 2017]. Available from: https://en.oxforddictionaries.com/definition/cognition

[4] Douglas A, Liu L, Warren S, Hopper T. Cognitive assessments for older adults: which ones are used by Canadian therapists and why. Can J Occup Ther. 2007;74(5):370-81.

[5] Hsieh S, Schubert S, Hoon C, Mioshi E, Hodges J. Validation of the Addenbrooke's Cognitive Examination III in Frontotemporal Dementia and Alzheimer's Disease. Dement Geriatr Cogn Disord. 2013;36(3-4):242-50.

[6] Mioshi E, Dawson K, Mitchell J, Arnold R, Hodges J. The Addenbrooke's Cognitive Examination Revised (ACE-R): A brief cognitive test battery for dementia screening. Int J Geriatr Psychiatry. 2006;21(11):1078-85.

[7] Charernboon T, Jaisin K, Lerthattasilp T. The Thai version of the addenbrooke's cognitive examination iii. Psychiatry Investig. 2016;13(5):571-73.

[8] Velayudhan L, Ryu SH, Raczek M, Philpot M, Lindesay J, Critchfield M, et al. Review of brief cognitive tests for patients with suspected dementia. Int Psychogeriatr. 2014;26(08):1247-62.

[9] Porrselvi AP, Shankar V. Status of cognitive testing of adults in India. Ann Indian Acad Neurol. 2017;20(4):334-40.

[10] Office of the Registrar General & Census Commissioner, India, Ministry of Home Affairs, Government of India [Internet], 2011 [cited 30 May 2017] Available from: http://www.cencusindia.gov.in>srs_report.

[11] Logiudice D, Vrantsidis F, Rayner V, Dow B, Oconnor D, Runci S. A review of translated cognitive assessment tools to assess culturally and linguistically diverse (CALD) older people. Alzheimers & Dementia. 2012;8(4):540.

[12] Escobar J, Burnam A, Karno M, Forsythe A, Landsverk J, Golding J. Use of the Mini-Mental State Examination (MMSE) in a community population of mixed ethnicity. J Nerv Ment Dis. 1986;174(10):607-14.

[13] O'Connor DW, Pollitt PA, Treasure FP, Brook CPB, Reiss BB. The influence of education, social class and sex on Mini-Mental State scores. Psychological Med. 1989;19:771-76.

[14] Mathuranath PS, Hodges JR, Mathew R, Cherian PJ, George A, Bak TH. Adaptation of ACE III for Malayalam speaking population in Southern India. Int J Geriatr Psychiatry. 2004;19(12):1188-94.

[15] Dementia test [Internet]. The University of Sydney. [cited 2018Mar16]. Available from: https://sydney.edu.au/brain-mind/resources-for-clinicians/dementia-test.html

[16] Rose M, Marie FSP, Brenda NW. French Canadian Cross Cultural Adaptation of the Developmental Coordination Disorder Questionnaire '07: DCDQ-FC. Can J Occup Ther. 2011;78(5):318-25.

[17] Haccoun RR. Une nouvelle technique de verification de equivalence de mesures pschologiques tradiutes. Revue Quebecoise De Psychologie. 1987;8(3):30-39.

[18] Diwan S, Diwan J, Patel P, Bansal AB. Validation of Gujarati Version of ABILOCO-Kids Questionnaire. J Clin Diagn Res. 2015;9(10):YC01-04.

[19] Ganguli M, Ratcliff G, Chandra V, Sharma S, Gilby J, Pandav R, et al. A hindi version of the MMSE: The development of a cognitive screening instrument for a largely illiterate rural elderly population in india. Int J Geriatr Psychiatry. 1995;10(5):367-77.

[20] dos Santos Kawata K, Hashimoto R, Nishio Y, Hayashi A, Ogawa N, Kanno S, et al. A Validation Study of the Japanese Version of the Addenbrooke's Cognitive Examination-Revised. Dement Geriatr Cogn Dis Extra. 2012;2(1):29-37.

[21] Matias-Guiu JA, Bobadilla RFD, Escudero G, Perez-Perez J, Cortes A, Morenas Rodriguez E, et al. Validation of the Spanish version of Addenbrooks Cognitive Examination III for diagnosing dementia. Neurologia. 2015;30(9):545-51.

[22] WHO Process of translation and adaptation of instruments [Internet]. Who.int. 2017 [cited 18 December 2017]. Available from: http://www.who.int/substance_abuse/research_tools/translation/en/

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