

Cross-Cultural Adaptation of Gujarati Version of Rowland Universal Dementia Assessment Scale for Assessing Cognition in Elderly Population

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ABSTRACT

Background: The Rowland Universal Dementia Assessment Scale (RUDAS) has less educational bias when compared to other cognitive assessment scales like MMSE and MoCA. But its performance has not been adequately addressed in Indian population. Moreover, there are very less scales for cognition which are available in Gujarati language which can be taken in elderly population. Therefore, the reliability and validity of Gujarati-RUDAS in elderly population needs to be tested.

Purpose: To determine the reliability and validity of the translated Gujarati version of Rowland Universal Dementia Assessment Scale (RUDAS) for assessing cognition in elderly population.

Methodology: A total of 60 subjects were included in this study according to the inclusion criteria. After gaining cross-cultural adaptations, reliability was assessed with intra-rater and inter-rater reliability, analyzed by intraclass correlation coefficient (ICC). Validity was assessed with content validity, analyzed by content validity index (CVI),

Result: Intra-rater reliability was having good reliability with ICC value of 0.757 and inter-rater reliability was found to be moderately reliable with ICC value of 0.700. Content validity was found to be good with CVI of 1.

Conclusion: The Gujarati version of RUDAS (G-RUDAS) is a reliable and valid tool for the screening of cognitive impairment among elderly population.

Keywords: Cognition, Validation, Rowland Universal Dementia Assessment Scale (RUDAS), Gujarati version, Geriatrics, Psychometric properties, cross-cultural adaptation.

INTRODUCTION

India, a developing nation, is home to many different cultures and traditions. But as the country becomes more industrialized and urbanized, the social structures are undergoing numerous changes that have a significant impact on the elder population. (1)

In the past 50 years, India's population has nearly tripled, while the proportion of seniors has more than double by four. According to the Census of 2011, there are now 100 million senior people in India, or 8% of the country's overall population. By 2050, the number of senior people is anticipated to reach 315 million. (2)

Because of various changes in the ageing brain that affect (and include) cognition, the current demographic shift that is increasing the population of older people is likely to offer difficulties like low quality of life and increased dependency. Independent investigations conclusively demonstrated that cognitive function declines with age. Previous studies found that among urban residents 60 years of age and older, there was a prevalence of cognitive impairment of

15.7% (10.5% mild impairment, 5.2% moderate to severe impairment).⁽³⁾

In recent years, cognitive science has advanced knowledge of cognitive disability. The ability to attribute mental states, such as thoughts and objectives, to oneself and others is known as cognition. Although cognitive impairment is not a specific mental ailment, it describes the state of people who are going through a wide range of dementing processes.⁽²⁾

Given its high incidence, dementia poses a significant financial burden in terms of patient care, diagnosis, and treatment. It is clear that early and accurate diagnosis is the cornerstone of this process when associated psychosocial changes and isolation of both patients and their relatives are taken into account. Early treatment beginning improves patients' quality of life and lowers healthcare costs. There are several trustworthy and legitimate cognitive evaluation tests that were created in accordance with the nations and sociocultural characteristics of the individuals in order to get early and accurate diagnosis. These tests do, however, have advantages and disadvantages. It is essential to create new tools in everyday practice to fill in the gaps left by the current examinations. Cognitive assessment tests are quick cognitive inspection instruments that are used to gauge the degree of cognitive decline, the rate at which it is progressing over time, and how well a patient is responding to particular treatment methods. One of the most frequently utilized evaluation tools globally is the Mini-Mental State Examination (MMSE). Despite being utilized all around the world, the MMSE has some known issues that reduce the reliability of the results in a particular group. The exam results are particularly challenging to understand among communities with low educational levels and English-speaking minorities.⁽⁴⁾

The Montreal Cognitive Assessment (MoCA) is the suggested screening tool for Minimal Cognitive Impairment (MCI) in the

domain of cognitive function assessment. Although it is influenced by factors like ethnic diversity, lifestyle choices, and educational attainment, the MoCA has been the most widely used test in identifying MCI. In actual practice, administering it takes time as well. It might not be appropriate for outpatient and bedside settings. When it comes to diagnosing MCI, the RUDAS performs well. It could be used as an alternative tool because it is shorter than the MoCA. Its performance in the Indian context, however, has not been adequately addressed.⁽⁵⁾

In Australia, the Rowland Universal Dementia Assessment Scale (RUDAS) was created in 2004 with the specific goal of addressing the challenges associated with diagnosing cognitive impairment in people with socioculturally varied backgrounds. The RUDAS can be readily administered in an outpatient clinic, has a 6-item scoring system, and evaluates a number of cognitive functions. The initial validation research, which was done in the Australian population, demonstrated that the psychometric properties were flawless. The RUDAS results have also been demonstrated in a number of nations to be independent of language characteristics and educational attainment. As a result, the RUDAS may be a useful tool in the evaluation of populations with a variety of cultures and languages. Finding a valid and reliable test to evaluate cognitive processes in our community is crucial because India has a diverse population. The reliability and validity of RUDAS as a screening tool for assessing neurocognitive disorder in elderly population were evaluated in this study.⁽⁴⁾

MATERIALS & METHODS

This study was conducted in Navsari, Gujarat, India. A total of 105 patients were screened out of which 55 subjects who were falling in the category of elderly population were included in the study for analysis. Sample size was calculated from the following table.⁽¹¹⁾

ICC = 0.7			ICC = 0.8		
<i>m</i> repeated measurements	95% CI ± 0.1 <i>n</i>	95% CI ± 0.2 <i>n</i>	<i>m</i> repeated measurements	95% CI ± 0.1 <i>n</i>	95% CI ± 0.2 <i>n</i>
2	100	25	2	50	13
3	67	17	3	35	9
4	56	14	4	30	8
5	50	13	5	28	7
6	47	12	6	26	7

Assuming the value of R (reliability value of Intra-class correlation coefficient) was to be 0.80 or more with 95% confidence interval, a total of 50 subjects were required for the present study, but considering the dropout rate, which was assumed to be 5-10%, a total of 60 subjects were included in the study. Purposive sampling was used. Study duration for this study was 5 months and data were collected from S.S. Agrawal Institute of Physiotherapy and Medical Care Education, Navsari.

Individuals whose age was above 50 years and individuals who are able to speak and understand Gujarati language were included in this study. Individuals who are not able to understand simple commands and **Visual or auditory loss** were excluded from this study.

PROCEDURE

The translation and cross-cultural adaptation process was conducted using “Guidelines for the process of cross-cultural adaptation of self-reported measures” as recommended by Beaton et al. ⁽¹²⁾ However, the back translation was not performed as suggested by Epstein et al. ⁽¹³⁾ since it does not have added benefit compared with expert committee review only and that it can be avoided where committee is proficient enough. ⁽¹⁴⁾

Step 1: Translation into Gujarati:

The RUDAS was translated from English into Gujarati followed by the essential steps recommended. The steps are: conceptualized on Newmark’s concept of

“communicative translation” for gaining dynamic equivalence between the source and target texts. “Communicative translation attempts to produce in its readers an effect as close as possible to that obtained on the readers of the original.” ⁽¹⁵⁾ Two native Gujarati speakers, one of whom was a linguist and another one a health care professional, who knew English as a second language independently, translated the text.

Step 2: Synthesis (a common Gujarati translation):

A consensus meeting between the researchers, with the original version of the questionnaire was held and a common synthesis was produced with a written report carefully documenting the synthesis process. During the synthesis process, appropriate Gujarati words for various terms were discussed and a pre-final version was synthesized.

Step 3: Review Committee:

For checking of final version for semantic and idiomatic equivalence acceptable for dynamic equivalence bilingual committee consisting clinicians and translators reviewed the text and ended with the pre-final version of Gujarati-RUDAS.

Step 4: Testing of pre-final version of the questionnaire:

Pre-final Gujarati version of RUDAS was tested on 30 individuals aged 50 years and above. The participants were asked to complete the questionnaires and were

additionally interviewed with open questions to find the differences between the meaning of the items and their actual responses. They were asked to rate their understanding of all the 6 items of Gujarati version of RUDAS on a 10-point numeric rating scale (where 0 is not at all understandable and 10 is completely understandable). The responses on all the items were further discussed in the expert committee along with proportion of missing responses. We noticed that there was 100% response in all the items except for 'visuoconstructional drawing'. These participants responded that they were holding the pencil in their hand after a long time and did not know how to draw the cube.

The present study was initiated, where a total of 60 subjects were included who were found to be satisfying all the inclusion criteria. A detailed explanation regarding the complete procedure was done for each subject and as a formality towards their willingness to be a part of this study, they were asked to sign a written consent.

Demographic characteristics and assessment of the participants were taken before filling scale.

INTRA-RATER RELIABILITY: After explaining the procedure, the patients were asked the questions from Gujarati-RUDAS, one by one. The scoring was done by the same rater on day one and day three for testing the intra-rater reliability.

INTER-RATER RELIABILITY: Inter-rater reliability was assessed by incorporating a qualified 2nd rater to score

separately apart from rater 1. The recording sheets used by rater 2 were totally separate from rater 1 sheets. Care was taken towards observation of proper blinding between the 2 raters to rectify any bias.

CONTENT VALIDITY: The content validity was examined by 1 Physiotherapist, 1 Physician, 1 PhD in Gujarati, and 1 MA B.Ed. in English who evaluated the translated text. Content Validity Index (CVI) was used for the validation of content validity. The suggestions of the experts were used for last modifications of the questionnaire when necessary.

STATISTICAL ANALYSIS

Data analysis is done using the SPSS software version 23.0.

Results are considered significant at $p < 0.05$ and confidence interval of 95%. Data analysis is done by:

Intra class correlation coefficient for inter rater and intra rater reliability which is regarded as a key indicator of reliability.

Bland -Altman limits of agreement analysis for assessing the agreement between rater's scores.

Standard error of measurement (SEM) to calculate the variability in measurement of same individual. The true measurement can be calculated as $1.96 * SEM$.

Smallest real difference (SRD) is the smallest change that can be interpreted as a real difference. It is calculated as $SRD = 1.96 * 2 * SEM$.

CVI for calculating content validity

RESULT

Variable	N (%) or mean SD
Age	66.83 ± 6.165
Gender	
Male	15 (50%)
Female	15 (50%)
Educational Status	
Uneducated	1 (3.3%)
Primary	2 (6.7%)
Secondary	13 (43.3%)
Higher Secondary	2 (6.7%)
Graduation	11 (36.7%)
Post Graduation	1 (3.3%)

Table 1: Demographic details of participants in testing pre-final version of Gujarati-RUDAS

Variable	N (%) or mean SD
Age	62.40 ± 9.199
Gender	
Male	27 (45%)
Female	33 (55%)
Educational Status	
Uneducated	3 (5%)
Primary	8 (13.3%)
Secondary	29 (48.3%)
Higher Secondary	3 (6.7%)
Graduation	14 (23.3%)
Post Graduation	2 (3.3%)

Table 2: Demographic details of 60 participants in checking Gujarati-RUDAS

	N	Min	Max	Mean	SD
RUDAS (rater 1, day 1)	60	19	29	25.18	2.079
RUDAS (rater 1, day 3)	60	21	29	26.25	1.633
RUDAS (rater 2)	60	23	29	26.37	1.414

Table 3: Descriptive statistics of RUDAS of all the individuals

Intra-rater reliability: To calculate reliability coefficients for ordinal data Intra-Class correlation coefficient (ICC) can be used as per the following table:

	Continuous scale	Ordinal scale	Nominal scale
Reliability	ICC	ICC or weighted kappa	unweighted kappa
Measurement error/ agreement	SEM or limits of agreement	% agreement	% agreement

The RUDAS scale is an ordinal scale. Therefore, to calculate intra-rater reliability coefficients ICC can be used. ⁽¹⁶⁾

To evaluate the value of reliability following guideline can be used:

- < 0.5 – poor Reliability
- 0.5 to 0.75 – moderate Reliability
- 0.75 to 0.9 – good Reliability
- 0.90 – excellent Reliability ⁽¹⁷⁾

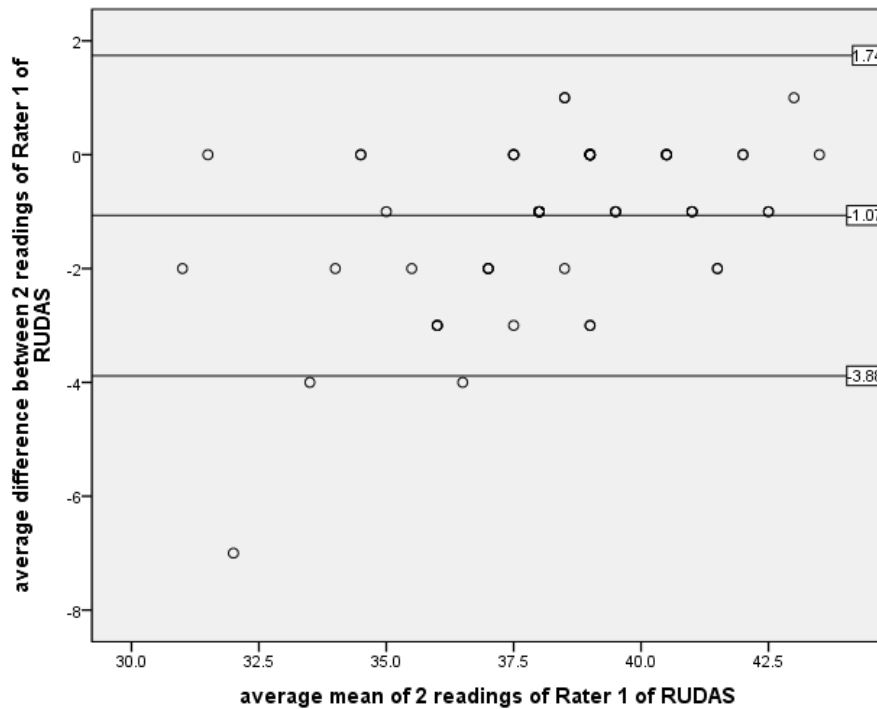
	ICC	CI (lower)	CI (upper)
RUDAS total	0.757	0.355	0.887

Table 5: Intra-class Correlation Coefficient (ICC) for the Intra-rater reliability of the total score of RUDAS scale

The ICC value for total RUDAS score is 0.757 which according to the above-

mentioned guidelines indicates good intra-rater reliability.

ICC values for intra-rater reliability shows correlation between the 2 readings of rater 1. Apart from correlation, limits of agreement need to be evaluated. Limits of agreement can be evaluated by Bland Altman limit of agreement plot. For plotting Bland Altman limit of agreement plot the average mean of 2 readings of rater 1 is plotted on the x-axis, against the average difference between 2 readings of rater 1 on the y-axis. 3 horizontal lines are superimposed on the plot. 1 line at the center represents average difference between the 2 measurements. 2 lines above and below the midline represents the limit of agreement drawn at $M \pm 1.96 SD$.



Graph 1: Bland Altman limit of agreement between 2 readings of rater 1

The Bland Altman limits of agreement between 2 readings of rater 1 for FAB scale shows that most of the values fall in $M \pm 1.96SD$ ($p < 0.05$). It indicates excellent reliability. Limits of agreement represents of how much the score can vary in stable patients. Change in score within the limits of agreement (known as Smallest Real Difference) can be attributed to measurement error and only if the score falls outside the limits of error, it can be said that there are statistically significant changes. Therefore, we need to calculate SRD/MDC for which standard error of measurement needs to be calculated first. SEM (Standard Error of Measurement) value of variability has been calculated by the following formula:
 $SEM = SD * \sqrt{1-ICC}$
 Therefore, the SEM value for variability between 2 readings of rater 1 is:
 $SEM = 0.708$
 The true SEM value for variation in measurements between the 2 readings of rater 1 is $1.96 * 0.708 = 1.386$, which suggests that any individual value lies within the range of ± 1.386 of RUDAS measured value.

MDC (Minimal Detectable Change) also known as SRD (Smallest Real Difference) can be calculated by following formula:
 $MDC = 1.96 * \sqrt{2} * SEM$

	Day 1- Day 3
SEM	0.708
MDC/SRD	2.332

Table 4: SEM and MDC value between 2 readings of rater 1

Therefore, the SRD value for variation between 2 readings of rater 1 is 2.332.

Inter-rater reliability: As mentioned for the intra-rater reliability, ICC can be used to calculate reliability coefficient for inter-rater reliability. ⁽¹⁶⁾

To evaluate the value of reliability following guideline can be used:

- < 0.5 – poor Reliability
- 0.5 to 0.75 – moderate Reliability
- 0.75 to 0.9 – good Reliability
- 0.90 – excellent Reliability ⁽¹⁷⁾

	ICC	CI (lower)	CI (upper)
RUDAS total	0.700	0.214	0.861

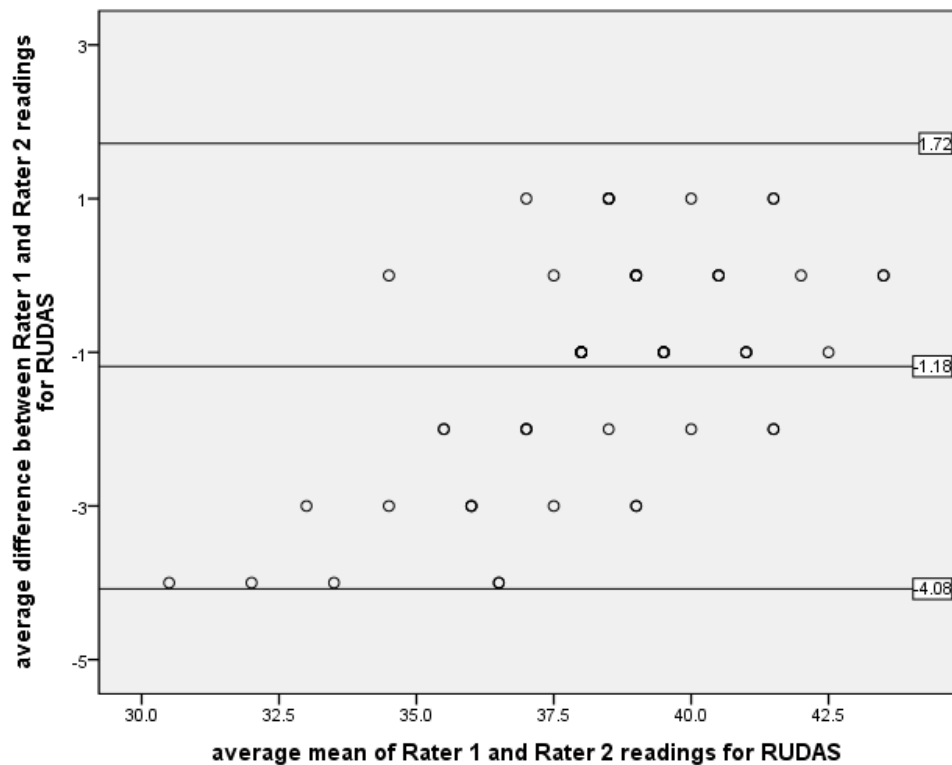
Table 5: Intra-class Correlation Coefficient (ICC) for the Inter-rater reliability of the total score of RUDAS scale

The ICC value for total RUDAS score is 0.700 which according to above mentioned

guidelines represents moderate inter-rater reliability.

Same as for intra-rater reliability, limits of agreement between 2 raters can be evaluated by Bland Altman limit of agreement plot. For plotting Bland Altman limit of agreement plot the average mean of rater 1 and rater 2 readings is plotted on the x-axis,

against the average difference between rater 1 and rater 2 readings on the y-axis. 3 horizontal lines are superimposed on the plot. 1 line at the center represents average difference between the 2 measurements. 2 lines above and below the midline represents the limit of agreement drawn at $M \pm 1.96 SD$.



Graph 2: Bland Altman limit of agreement between rater 1 and rater 3

The Bland Altman limits of agreement between 2 raters for G-RUDAS shows that most of the values fall in $M \pm 1.96SD$ ($p < 0.05$). It indicates good reliability. As done for intra-rater reliability Smallest Real Difference/Minimal Detectable Change needs to be calculated for which SEM value should be calculated first.

SEM (Standard Error of Measurement) value of variability has been calculated by the following formula:

$$SEM = SD * \sqrt{1-ICC}$$

Therefore, the SEM value for variability between 2 raters is:

$$SEM = 0.81$$

The true SEM value for variation in measurements between the 2 raters is $1.96 * 0.81 = 1.587$, which suggests that any

individual value lies within the range of ± 1.587 of RUDAS measured value.

MDC (Minimal Detectable Change) also known as SRD (Smallest Real Difference) can be calculated by following formula:

$$MDC = 1.96 * \sqrt{2} * SEM$$

	Rater 1 – Rater 2
SEM	0.81
MDC/SRD	2.494

Table 6: SEM and MDC value between 2 raters

Therefore, the SRD/MDC value for variation between 2 raters is 2.494.

Content validity: The Content Validity Index (CVI) was calculated as an empirical measurement analysis to validate the validity of the instrument. (18) The suggested

formula and procedures to determine the CVI is illustrated in Table 7.

No.	Matter											
1	Scale	Ordinal										
2	Formula	$CVI = \frac{n}{N}$ Divide the ordinal scale into two groups for example for scales 1, 2, 3, 4: 1 and 2: a group for “not agreed”, 3 and 4: a group for “agreed” and vice versa. n – numbers of evaluator agreed N – sum of evaluator Mean CVI is a mean of all CVI each item.										
3	Range accepted	<table border="1"> <thead> <tr> <th>N</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>2-4</td> <td>1.00</td> </tr> <tr> <td>5</td> <td>> 0.83</td> </tr> <tr> <td>6</td> <td>> 0.86</td> </tr> <tr> <td>7-10</td> <td>> 0.78</td> </tr> </tbody> </table>	N	Value	2-4	1.00	5	> 0.83	6	> 0.86	7-10	> 0.78
N	Value											
2-4	1.00											
5	> 0.83											
6	> 0.86											
7-10	> 0.78											

Table 7: Determining the Content Validity Index (CVI)

Table 7 shows the method of determining content validity using CVI. There were 4 evaluators who were asked for the validation of G-RUDAS. Using the CVI method, the acceptable standard for index of average congruity recommended by M. R. Lynn (17) is 0.10 for 2 to 4 evaluators. In this case, both index of CVI for content validity is 1.00.

DISCUSSION

For valid decision making in clinical practice, high-quality outcome measures that meet rigorous measurement standards are required. The present study was conducted to determine whether Gujarati-RUDAS has good inter-rater and intra-rater reliability and content validity for the evaluation of cognition in elderly population.

In the present study out of 60 patients with the age of 50 years and above, 27 were male and 33 were female. Out of 60 subjects, majority of subjects were having secondary education (48.3%). The study ended up with

a conclusion that the Gujarati-RUDAS is reliable and valid tool to evaluate cognition in elderly population.

Furthermore, in this study mean and SD of G-RUDAS for both the raters are: The mean and SD of G-RUDAS are 25.18 and 2.079 for rater one (R1, day 1), the mean and SD of G-RUDAS are 26.25 and 1.633 for rater one (R1, day 2) and the mean and SD of G-RUDAS are 26.37 and 1.414 for rater two (R2).

The RUDAS takes about 10 minutes to complete and tests multiple cognitive domains. In particular, items relevant to frontal lobe function, such as “crossing the road”, “animal generation”, and “cube copying”, evaluate executive functioning (the ability to initiate, plan and execute tasks relevant to daily living), both directly and indirectly. Lack of evaluation of executive function is a major limitation of the MMSE, which usually fails to detect meaningful deficits involving the frontal lobes. The diverse response formats of the RUDAS (verbal, non-verbal, written and praxis)

allow more comprehensive assessment of a subject's overall cognitive ability. Impairment in a domain necessary to communicate a response (but not necessarily causing important cognitive deficits) is not over-emphasized, thereby reducing misclassification of cognitive capacity. ⁽⁷⁾

Reliability

The result of this study demonstrated that the G-RUDAS has good intra-rater (ICC 0.757) and moderate inter-rater (ICC 0.700) reliability as quantified by ICC when used to assess cognition in elderly population. The results of this study are found to be reliable but they are not as same as other versions of RUDAS. In original validation study, test-retest reliability (ICC = 0.98) was shown to be significant. ⁽⁷⁾ Chen et al. ⁽¹⁹⁾ published the study validating Chinese version of RUDAS in 2015 with test-retest reliability of (ICC = 0.90). In Turkish study done in 2019, test-retest reliability was found to be (ICC = 0.987). Also, Salari et al. ⁽²⁰⁾ showed test-retest correlation of the RUDAS 0.96 in Iran validation study. Our result was moderately similar to the literature with ICC value of around of 0.73.

SEM (standard error of measurement) and SRD (smallest real difference)

To assess the reliability in more detail SEM and MDC values were calculated. No previous studies have been reported for the SEM and MDC values. From the present study SEM value for intra-rater is 0.708 and for inter-rater is 0.81. MDC value for intra-rater is 2.332 and for inter-rater is 2.494. The value of MDC represents the minimal difference that would reflect a real change in the G-RUDAS total score, hence having found from the present study, this value can now be used as reference value to compare the outcomes and results of studies to be done hence forth using G-RUDAS tool.

Bland Altman limits of agreement

In this study, SEM value is from corresponding variability in measurements

of both the raters, the finding of Bland Altman limits of agreement showed good inter-rater agreement between rater one (R1) and rater two(R2) (limits of agreement = 1.72 to -4.08).

In present study, the finding of Bland Altman limits of agreement showed good intra rater agreement between rater. Similarly results of Bland Altman limits of agreement between two occasions by rater 1 at day 1 and day 3 showed good agreement (limits of agreement = 1.74 to -3.88).

Validity

In this study, the content validity was calculated by using Content Validity Index (CVI). There were 4 experts chosen for getting the validation of translated Gujarati version of original RUDAS. The ratings of all the raters were favorable for all the 6 items of G-RUDAS and the final CVI calculated from the ratings was found to be 1. Therefore, the developed G-RUDAS could be considered as having good content validity, indicating that the G-RUDAS for checking cognition in elderly population have satisfactory validity.

The results of the present study are in line with the study done by Gizem Ayan et al. ⁽⁴⁾ in 2019 while determining the reliability and validity of RUDAS in Turkish population. In this study, the content validity was determined by content validity index (CVI). The RUDAS was analyzed by 7 specialists, and content validity was provided for all items. The content validity ratio of all items was 100%, and when CVI was assessed, it was found to be above 80% showing good validity.

CONCLUSION

The Gujarati version of RUDAS (G-RUDAS) is a reliable and valid tool for the screening of cognitive impairment among elderly population. It is comprehensive, culturally appropriate and user-friendly instrument for use in clinical settings as well as research purposes. The availability of this measure will encourage and facilitate decision making and further researches.

Limitations of the study

1. Unable to screen the participants with any cognitive impairment due to lack of valid instrument available in Gujarati.
2. There is no long-term follow up of the patients to understand the power of the G-RUDAS to understand the changes in cognitive functions by the time.
3. Total score of G-RUDAS can't be correlated with the educational status due to uneven distribution of sample.

Future recommendations

1. Reliability and validity of G-RUDAS can be tested in other populations with neurological conditions.
2. It would be advisable to conduct further validation studies of Gujarati-RUDAS in different settings and in larger groups.
3. Total G-RUDAS score can be correlated with the educational status of the participants with equal distribution of sample in accordance with education.

Declaration by Authors

Ethical Approval: Approved

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Conflict of Interest: The authors declare no conflict of interest.

Supplementary Material

[Click Here to Download Gujarati version of RUDAS \(G-RUDAS\)](#)

REFERENCES

1. Dr. Jayshree Mishra. The effects of Aging in Cognitive abilities with reference to Indian Society. *International Journal of All Research Education and Scientific Methods (IJARESM)*. 2021 August; 9(8): 1747-1750.
2. Singh P, Govil D, Kumar V, Kumar J. Cognitive impairment and quality of life among elderly in India. *Applied Research in Quality of Life*. 2017 Dec; 12(4):963-79.
3. Konda PR, Sharma PK, Gandhi AR, Ganguly E. Correlates of cognitive impairment among Indian Urban Elders. *Journal of gerontology & geriatric research*. 2018;7(6).
4. Ayan G, Afacan C, Poyraz BC, Bilgic O, Avci S, Yavuzer H, Yuruyen M, Erdinler DS, Ayan B, Doventas A. Reliability and validity of rowland universal dementia assessment scale In Turkish population. *American Journal of Alzheimer's Disease & Other Dementias®*. 2019 Feb;34(1):34-40.
5. Manjavong M, Limpawattana P, Sawanyawisuth K. Performance of the Rowland Universal Dementia Assessment Scale in Screening Mild Cognitive Impairment at an Outpatient Setting. *Dementia and Geriatric Cognitive Disorders Extra*. 2021;11(2):181-8.
6. Henrica C. W. de Vet CBT, Lidwine B. Mokkink, Dirk L. Knol. *Measurement in Medicine: A Practical Guide*. 2011.
7. Storey JE, Rowland JT, Conforti DA, Dickson HG. The Rowland universal dementia assessment scale (RUDAS): a multicultural cognitive assessment scale. *International Psychogeriatrics*. 2004 Mar;16(1):13-31.
8. Naqvi RM, Haider S, Tomlinson G, Alibhai S. Cognitive assessments in multicultural populations using the Rowland Universal Dementia Assessment Scale: a systematic review and meta-analysis. *CMAJ*. 2015 Mar 17;187(5):E169-75.
9. Nepal GM, Shrestha A, Acharya R. Translation and cross-cultural adaptation of the Nepali version of the Rowland universal dementia assessment scale (RUDAS). *Journal of patient-reported outcomes*. 2019 Dec;3(1):1-7.
10. Iype T, Ajitha BK, Antony P, Ajeeth NB, Job S, Shaji KS. Usefulness of the Rowland universal dementia assessment scale in South India. *Journal of Neurology, Neurosurgery & Psychiatry*. 2006 Apr 1;77(4):513-4.
11. Henrica C. W. de Vet CBT, Lidwine B. Mokkink, Dirk L. Knol. *Measurement in Medicine: A Practical Guide*. 2011.
12. Beaton, D. E., Bombardier, C., Guillemin, F., & Ferraz, M. B. (2000). Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine.*, 25(24), 3186–3191.
13. Epstein, J., Osborne, R. H., Elsworth, G. R., Beaton, D. E., & Guillemin, F. (2015). Cross-cultural adaptation of the health education impact questionnaire: Experimental study showed expert committee, not back-translation, added

- value. *Journal of Clinical Epidemiology*, 68(4), 360–369.
14. Girard, M. P., Marchand, A. A., Stuge, B., Ruchat, S. M., & Descarreaux, M. (2016). Cross cultural adaptation of the pelvic girdle questionnaire for the French-Canadian population. *Journal of Manipulative and Physiological Therapeutics*, 39(7), 494–499.
 15. P Newmark. “Approaches to translation New York, London”. Prentice Hall MacMillan (1995).
 16. Henrica C. W. de Vet CBT, Lidwine B. Mokkink, Dirk L. Knol. *Measurement in Medicine: A Practical Guide*. 2011.
 17. Henrica C. W. de Vet CBT, Lidwine B. Mokkink, Dirk L. Knol. *Measurement in Medicine: A Practical Guide*. 2011.
 18. M. R. Lynn, M. R. (1986). “Determination and quantification of content validity,” *Nursing Research*, vol. 5, pp. 382–385, 1986.
 19. Chen CW, Chu H, Tsai CF, et al. The reliability, validity, sensitivity, specificity and predictive values of the Chinese version of the Rowland Universal Dementia Assessment Scale. *J Clin Nurs*. 2015;24(21-22):3118-3128.
 20. Salary S, Shaeiri M, Asghari-Moghadam MA. Assessing the validity and reliability of Rowland’s Universal Dementia Assessment Scale (RUDAS) in patients with dementia. *Zahedan J Res Med Sci*. 2014;16(9):72-74.

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