Psychometric characteristics of the rowland universal dementia assessment scale amongst Iranian elderly

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Abstract

Dementia is a prevalent old age disease, which causes disabilities and cognitive impairment in people. Given the increasing elderly population in Iran, there is a need for appropriate cognitive impairment screening tools. This study was conducted to do validity and reliability of Rowland Universal Dementia Assessment Scale (RUDAS) in a group of elderly in Iran. This descriptive-correlative study was conducted on 110 elderly, selected by convenient sampling method. Data were analyzed using mean and standard deviation. Reliability was ensured with test-retest and Cronbach's alpha methods. Spearman correlation coefficient and confirmatory factor analysis were also used. According to results, reliability was confirmed through Cronbach's alpha 0.91, split-half method, test-retest (with a two-week interval). Appropriate convergence-divergence validity was obtained. Factor analysis indicated saturation of scale with one factor. Thus, it can be concluded that this scale has appropriate validity and reliability and a single-factor construct, which shows high inter-item correlation.

Keywords: Elderly, Psychometric characteristics, Rowland Universal Dementia Assessment, Iran

Introduction

Iran is a developing country. Currently, mean life expectancy is 72 years for women, and 69 years for men [1]. In Iran, much like in other countries, birth rate has reduced in parallel to mortality rate. This has resulted in higher proportion of people over 60 years of age in Iranian society, and compared to 5.2% in 2000, it is anticipated that this proportion will reach 21.7% of Iranian population by 2050. In Iran, elderly people are faced with health problems and social challenges [1]. Given increased life expectancy and population of the elderly, investigating cognitive processes and associated impairments appears to

be necessary. Dementia is a prevalent old age disorder, which is accompanied by severe and progressive disabilities. Dementia is a mental disorder, in which the individual is faced with a combination of poor memory, difficulty in calculations, distraction, mood swings, impaired judgment and abstract thinking, reduced language skills, and disorientation [2]. The most common symptom in early stages of dementia is poor short-term memory. One person is affected by dementia every 3 seconds. Dementia imposes a huge burden on patient, family, and community because it causes severe dysfunction and lack of independence

in patients, leading to dependence on others. Furthermore, dementia increases anxiety and depression in the family, and incurs a lot of time and money to care for the patient [3]. Dementia imposes huge annual cost on the community, as well. Increasing prevalence of dementia adds to the importance of its proper diagnosis. Detecting dementia in early stages increases chances of better response to treatment, and reduces the burden of this syndrome [4]. Screening tests have made early diagnosis possible, giving patients and families the possibility of receiving support [4]. Studies have shown that regular use of structured cognitive tests increases diagnostic accuracy of cognitive disorders [5]. There is a need for use of screening tools because therapists are usually unable to diagnose dementia in their routine work up without cognitive assessment [5]. A widely used screening test for early diagnosis of dementia is the "Mini Mental State Examination". However, due to limitations in application, this questionnaire does not seem to be a very accurate [6]. Other tests include Abbreviated Mental Test Score (AMTS) containing 10 items, some of which are culture-dependent [7]. The 6-Item Cognitive Impairment Test (6ICIT) is not affected by cultural bias, and has a good sensitivity and specificity, and suits diagnosis of mild dementia. But it is affected by participants' education level and age [8]. ACE-R test is also affected by culture, but distinguishes between common types of dementia such as symptoms of atypical Parkinson, progressive supranuclear palsy, multiple atrophy, and Lewy body dementia, even when MMSE score is within normal range [9]. Blessed Dementia Scale, one of the first scales for evaluation of dementia, combines cognitive and functional dimensions. This scale is less used because of the need to interview the patient and an informed person [10]. Given limitations in above scales, Rowland's Universal Dementia Assessment Scale (RUDAS) was created by Storey et al. (2004) to overcome these limitations. It contains 6 items, and each is scored differently from others [11]. Currently, there is no simple and reliable test to diagnose dementia in early stages, and none has the required adequacy for screening dementia. Generally many of these methods (scales, and indices) are used to measure severity of different symptoms such as cognitive and functional deterioration and behavioral changes. Inadequate assessment in many of these methods hinders assessment of the efficacy of a particular care or treatment approach. Patient's language and comprehension can also affect assessment. With patients requiring an interpreter, it must be ensured that the interpreter is not providing the patient with additional information, and is not explaining according to patient's response [12]. Dementia affects the elderly disproportionately, leading to disability and costs in health care. Thus, it is essential to diagnose early through tools that are compatible with culture [11]. Given all the above, the present study aims to investigate psychometrics of Rowland's Universal Dementia Assessment Scale (RUDAS) in a group of elderly in Kashmar city.

Method

This study was conducted on elderly population aged 63-98 years in the part of north-east of Iran, during 2012, of whom, 110 were selected according to convenient sampling method. Because of study inclusion and exclusion criteria and type of scale and its items (in interview form), random sampling was not possible. Study inclusion criteria were the ability to talk, no mobility problem, and age group between 63 years and 98 years. Those outside this age group with severe mobility problems and advanced speech impairment were excluded. Since this scale is in interview form, it can be used even for illiterate people. Convergence validity was assessed using Cognitive Decline Axis in Elderly Scale, and divergence validity using Geriatrics Depression Scale. Reliability was confirmed using Cronbach's alpha, split-half and test-retest (with a 2-week interval) methods.

RUDAS was designed by Storey et al. (2004) with 6 items for measuring cognitive dimensions, including memory and learning, orientation visio-spatial, planning and praxis, drawing, judgment, recall,

Languageorientation and memory (registration), spatial vision (building and drawing), attention and start, stagnation, judgment and language and plan, habits and behavior. In this scale, cut-off point was reported 23 (maximum score 30), specificity 89%, sensitivity 98%, inter-rater reliability 99%, and test-retest reliability 98%. In India, cut-off point was found 23 and 24 in translated versions of RUDAS and MMSE respectively (Lype et al., 2005) [24], and sensitivity and specificity of RUDAS were reported 88% and 76%, respectively. Scoring for each item is different from others, and total score is 30 [11].

Items and their final scores are as follows:

Memory: Patient is asked to imagine he is shopping with a list of 4 items. Five minutes later he is asked to repeat the list 3 times. No score is allocated for failure to perform this task after 5 attempts. Score is accounted for in memory item.

Body orientation: Patient is asked 8 questions about his left and right body parts (for example he is asked to show his right hand, or cover his left eye with right hand). One mark is allocated for every correct answer, making a maximum of 5 marks.

Praxis: Patient is asked to copy the examiner, and then perform one action. Scoring is as follows:

Normal=2: Very few self-correcting errors if any, progressively better, and good maintenance, with only slight disco ordination between hands.

Partially adequate=1: Significant errors, with little effort to correct them or maintain position, poor coordination.

Failed=0: Cannot perform the exercise or maintain position, makes no effort

Maximum score of 2 is attainable with correct performance of exercise.

Drawing: Patient has to draw a cube. Maximum score is 3, and each part scores one mark.
1- Is the image based on a square?
2- Can all internal lines be seen?
3- Can all external lines be seen?

Judgment: Patient is asked a question as follows:
You are standing in a crowded street, and there are no pedestrian crossings or lights, how are you going to cross the street unharmed? With partial answers to both parts of the question, he should be encouraged by asking "Is there anything else that you should do?"

Scoring:

Did he mention he should wait for vehicles? Yes=2, yes after encouragement=1, no=0

Did he propose additional safety precautions? Yes=2, yes after encouragement=1, no=0

Memory: Patient should remember items in his earlier shopping list. He scores 2 marks for each item remembered, with maximum of 8 marks.

Language: Patient is asked to recall as many animal names as possible in 1 minute. Each name scores one mark, with maximum of 8 marks. There will be no need to continue if 8 animals are recalled with no repeats within one minute.

Thus, maximum score for this scale will be 30. Informant Questionnaire on Cognitive Decline in the Elderly (IQCDE) [14]: This questionnaire was designed by Anthony Jerome, a member of Mental Health Research Center, affiliated to Australian National University in 2004 to measure patient's cognitive decline over the past 10 years [14]. Sixteen items of this questionnaire are scored according to a 5-point Likert scale, and assess 6 subscales of episodic memory, practical functions, instrumental daily activities, distant memory, time orientation, and ability to focus. Retest reliability with 3-day interval was reported 0.96, and with one-year interval 0.75 [15]. Studies in Iran indicate a significant correlation between IQCDE and MMSE and AMTS at 0.01. Therefore, it was used for assessing convergence validity.

Geriatrics Depression Scale (GDS) [17]: This was designed by Yasavagy et al., with 15 items [17]. GDS distinguishes 3 groups with moderate depression (5 to 10 marks), severe depression (10 to 15 marks), and healthy. In Iran, Malekoti et al. reported its alpha coefficient and retest reliability 0.96 and 0.85, respectively. Its concurrent validity with Zung & Hamilton Depression Scale was reported 0.87 and 0.95, respectively [18]. This test was used because two separate studies {14,

19] had shown that depression occurs before cognitive decline in the elderly, and orientation and memory problems occur after depression [19, 30].

To assess validity, reliability, and exploratory and confirmatory factor analysis, SPSS-16 and LISREL software were used.

Results

Of all 110 participating elderly, 44 were female (39.1%), and 66 were male (60.1%), with age range 63-98 years. The 75-85 years age group had the highest frequency, and 70-75 years the lowest. Mean age was 80.1 years and standard deviation 11.5. Of all participants, 32% were literate and the rest (66.5%) were illiterate. Cronbach's alpha and split-half reliability were found 0.91 and 0.87, respectively. Overall test-retest reliability with a 2-week interval was reported 0.86. Mean and standard deviation of overall RUDAS score and its dimensions are presented in Table 1.

Table1 *Mean and standard deviation of overall RUDAS score and its dimensions RUDAS*

	Women Mean±SD	Men Mean±SD	Total Mean±SD
Visual-spatial orientation	3.12 (1.00)	2.76 (1.45)	3.36 (1.45)
Praxis	1.02 (0.77)	2.09 (0.78)	1.55 (0.61)
Drawing	1.19 (0.89)	0.34 (1.32)	0.88 (1.19)
Judgment	0.29 (0.93)	0.79 (0.84)	0.75 (1.00)
Memory recall	0.58 (2.66)	4.56 (3.39)	3.54 (1.19)
Language	2.4 (5.43)	2.49 (3.46)	5.12 (1.8)
Total score of RUDAS	12.13 (6.73)	14.33 (6.03)	16.77 (4.48)

Table 2 *The convergent and divergent validity of RUDAS*

	P-Value	Depression	P-Value	Centered-cognitive decline in the elderly (informant)
Visual-spatial orientation	0.001	-0.273	0.002	-0.240
Praxis	0.03	-0.234	0.023	-0.145
Drawing	0.00	-0.10	0.01	-0.252
Judgment	0.008	-0.132	0.003	-0.253
Memory recall	0.001	-0.122	0.001	-0.220
Language	0.002	-0.301	0.02	-0.421
Total score of RUDAS	0.002	-0.231	0.001	-0.452

Sig: $P \leq 0.001*$

According to above tables, there is a positive and significant relationship between participants' scores and Rowland's scale and its 6 subscales. Also, subscales. Based on main components, exploratory factor analysis results indicated significance of Chi-square ($P \leq 0.0001$, df=2/10, $X2=12/963$). Hence, correlation matrix in population is not zero. KMO, specific value, and percentage variance were 0.78, 2.633, and 38.56, respectively. These results, together with scree plot (figure 1) show one factor saturation of RUDAS.

Discussion

This study aimed to investigate psychometrics of RUDAS in a group of elderly in Kashmar city. Results showed acceptable validity (convergence and divergence) and reliability (Cronbach's alpha, test-retest, and split-half), which agree with Salari et al. study [21] in elderly population with and without dementia. Also, results of factor analysis and saturation with one factor are in line with Salari study [22], Rowland [11], and Basic [23]. Lype et al. [25] investigated RUDAS among elderly

Table 3 *Correlation matrix between dimensions Rowland Universal Dementia Assessment Status (RUDAS)*

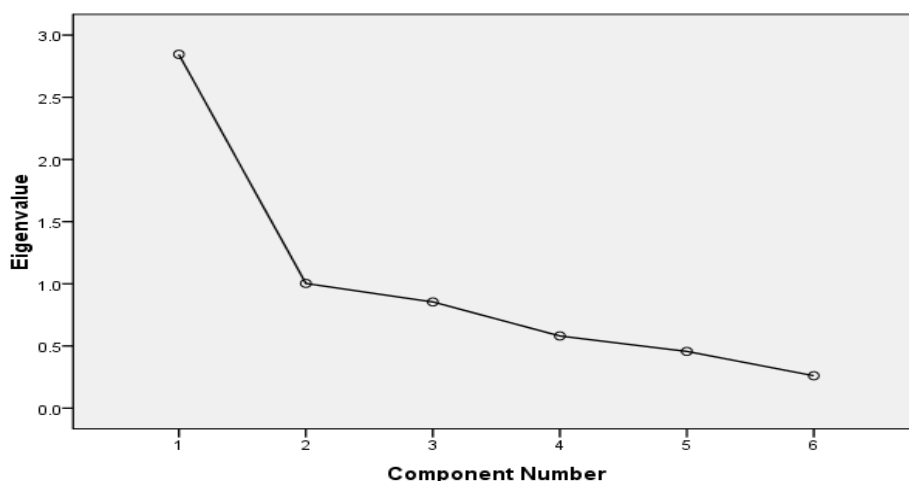|	Visual-spatial orientation	Praxis	Drawing	Judgment	Memory recall	Language
Praxis	0.342*					
Drawing	0.222	0.235				
Judgment	0.231*	0.211*	0.062*			
Memory recall	0.623*	0.248*	0.329*	0.102*		
Language	0.653*	0.298*	0.390*	0.232*	0.234*	
Total score of RUDAS	0.765*	0.600*	0.445*	0.278*	0.716*	0.78*

Figure 1 *Scree curve*

population in south India with 116 elderly participants, and found acceptable assessors and internal reliability 0.87 and 0.90, respectively, which are in line with the present study results [24]. Basic et al. investigated 3 dementia screening tools (GPCOG, MMSE, and RUDAS) in elderly population of two Australian cities. Correlation between RUDAS and MMSE was reported 0.78 and between RUDAS and GPCOG 0.76. They also reported correlation between RUDAS and GDS -0.231, and between RUDAS and IQCDE -0.45 [23]. These results indicated that higher score in Rowland scale meant lower depression and less cognitive decline.

Researchers like Chandler [25] and Schaie [26] believe that age-related cognitive decline is not worth considering until after retirement and 60 years of age, while others like Klein-Wolf [27] and McClain [28] argue that this decline is continuous and begins from mid or late 20's. The common feature in different type of cognition is that aging is associated with reduced pure intelligence or ability to process current data. Mental deterioration is the worst phenomenon that can happen in old age. According to Reisberg [29], most dementia assessing scales either rank cognitive functions separately or assess behavioral symptoms due to effect of dementia on life, and they can only be beneficial if the effects of interventions and therapies can be assessed. Neuropsychiatric Scale (NPI), used by psychiatrists, compares emotional symptoms such as emotional numbness, success, and happiness to similar behaviors, and includes dimensions: delusions, hallucination, dysphoria, anxiety, disinhibition, apathy, aberrant motor behavior, agitation, irritability, euphoria, sleep and eating disorders, most of which emerge in advanced stages of disease [30]. Moreover, frontal lobe dysfunction leads to dementia. However, because of patients' fewer complaints about their own cognitive weaknesses, severity of disease is often underestimated. In such cases,

a roommate or someone close to the patient, with sufficient knowledge of his daily routine can be of great help, and can better explain severity of disease to doctors. Existing tools cannot much help diagnosis before recurrence. But, since Rowland's scale can identify frontal lobe dysfunction, it can play an important role in early diagnosis and reducing cognitive problems of the disease [31]. Ismail et al. in their assessment of brief cognitive screening tools, proposed RUDAS as a tool unaffected by age, gender, or education, and as an effective tool for screening frontal lobe dysfunction [32].

Conclusion

Unlike other cognitive impairment diagnostic tools, Rowland's Universal Dementia Assessment Scale is one-factor saturated, which indicates high intra-item correlation. It can provide guidelines for numerous dementia screening studies, as was demonstrated in this and many other studies. A positive feature of this scale is that it is unaffected by age, gender or education. In the present study, scale was completed in interview form, and patients' education level had no effect on responses, which shows the importance of this scale in assessment of dementia in the elderly. It is hoped that this tool is used on many other subjects.

Acknowledgements

Contributions

Study design: MAA,SS,SM
Data collection and analysis: SM,SS
Manuscript preparation: SS,MS

Conflict of Interest

"The authors declare that they have no competing interests."

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