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VALIDITY AND RELIABILITY OF RAPID COGNITIVE SCREENING TEST FOR TURKISH OLDER ADULTS

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Abstract: *Objectives:* Practical cognitive screening tests, brief and easy-to-administer are needed for primary care. The Rapid Cognitive Screen (RCS) is one of the cognitive screening tests used. The present study aimed to establish the validity and reliability of the Turkish version of RCS (RCS-T) in patients with impaired cognitive status. *Design:* Prospective validation study. *Setting and Participants:* Total 323 outpatients aged 60 or older, who were performed comprehensive geriatric assessment, were included in the study. *Measurements:* Patients were screened by RCS-T, Turkish version of Saint Louis University Mental Status Examination (SLUMS-T), Mini–Mental State Examination (MMSE) and clock drawing test for cognitive impairment (CI). *Results:* The mean age of the patients was 72.2±7.4. Out of the patients, 217 were considered as cognitively intact, 54 as mild cognitive impairment (MCI), and 52 as Alzheimer's disease (AD). Cronbach's alpha value of the RCS-T was 0.674 for AD and 0.713 for CI. The total RCS-T scores were positively correlated with MMSE and SLUMS-T scores ($r = 0.647$ and $r = 0.864$, respectively) ($p < .001$, for each). The area under the receiver-operating characteristics curve (95% confidence interval) was 0.96 for AD, 0.92 for CI and 0.856 for MCI. The sensitivity and specificity for RCS-T for cut-off point of 6 and 4 were 85.85 (%) and 87.56 (%) for CI and 84.62 (%) and 91.14 (%) for AD, respectively. *Conclusions:* In a bedside consultation and primary care practice, RCS-T, a simple, quick and sensitive tool for screening CI, seems to be a useful screening test for older patients with CI.

Key words: Screening, Alzheimer's disease, mild cognitive impairment, cognitive impairment, Rapid Cognitive Screen.

Introduction

As the global prevalence of dementia is increasing, approximately 46 million people live with dementia worldwide (1). By 2050, one new case of Alzheimer's disease (AD) is expected to develop every 33 seconds, resulting in about 1 million new cases per year in the United States (1, 2). Early diagnosis is important for this increasingly frequent disease; thus, methods to improve early detection would provide opportunities for early intervention, symptomatic treatment, and improvement patient's function (3).

Cognitive assessment is a main part of comprehensive geriatric assessment (4). Identification of the etiology of memory loss is possible with detailed medical history, physical examination, and neurocognitive assessment (5). Neurocognitive assessment of patients with memory problems is pivotal in determining their cognitive state, but it is a time-consuming clinical evaluation which requires special training. Therefore, an ideal screening test for primary care should be easy-to-administer; brief (less than 5 minutes), valid, free to use; and exhibit low bias due to education, language, and culture (6).

There are a few cognitive screening tests for dementia and mild cognitive impairment (MCI), most of which take too much time to administer for especially primary care settings (7). Screening tests such as the clock drawing test (CDT), Mini-Cog (8) and Triple-test (9) take less than 5 minutes, but the sensitivity and specificity of these screening tools are poor for the diagnosis of MCI (10).

The Saint Louis University Mental Status Examination (SLUMS) is an 11-item, 30-point clinician-administered cognitive screening test with good sensitivity and specificity for both dementia and MCI (11-13). The SLUMS has been translated into many languages, including Turkish and validated in different cultures (14-16). Turkish version of SLUMS, which takes approximately 6 to 8 minutes to administer, is also demonstrated to have adequate validity and reliability to evaluate cognitive impairment (CI) among Turkish older adults (16). The Rapid Cognitive Screen (RCS), an abbreviated form of the SLUMS, is a brief screening tool (<3 minutes) examining recall, clock drawing, and insight (17).

The present study aimed to establish the validity and reliability of the Turkish version of RCS in patients with impaired cognitive status and to investigate the discriminative power of the test in patients with mild cognitive disorder and in normal participants.

Methods

Patients

A total of 323 patients aged over 60 years without exclusion criteria, who were admitted to the geriatrics outpatient clinic with memory complaints between June 2014 and March 2018, and underwent comprehensive geriatric assessment, were

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included in the study. All the participants were evaluated by comprehensive geriatric assessment, including physical and mental status examination and laboratory evaluation. All of the participants signed informed consent forms, which was consonant to the Declaration of Helsinki approved by the local ethics committee.

The diagnosis of MCI and AD

The diagnosis of major and minor CI was made according to the Diagnostic and Statistical Manual of Mental Disorders - fifth edition (DSM - 5) diagnostic criteria (18) and AD was diagnosed with National Institute on Aging-Alzheimer's Association workgroup's criteria (19).

Comprehensive Geriatric Assessment (CGA)

Socio-demographic characteristics of the participants including, age, gender and education, were recorded. According to the patients' education level, they were divided into 2 groups: less than high school education (≤8 years) and high school education and higher (≥9 years). All patients were examined to see whether they have cataract, hearing loss, hypertension, diabetes mellitus, coronary artery disease, congestive heart failure, peripheral vascular disease, hyperlipidemia, cerebrovascular disease, depression, dementia, and polypharmacy in their medical history. Cognitive functions of the patients were evaluated by Mini–Mental State Examination (MMSE), SLUMS-T and clock drawing test, which was completed by a geriatrician blinded to the diagnosis. In addition, scores of the Geriatric Depression Scale (20) and basic and instrumental Activities of Daily Living (BADL and IADL) indexes were also recorded for each patient. CGA is an evaluated protocol, including all above assessments (21). The Clinical Dementia Rating (CDR) instrument was also performed in all the patients.

The Rapid Cognitive Screen (RCS)

It is a brief instrument for the detection of cognitive dysfunction in primary care settings developed and validated in 2015 (17). The scale was obtained from the official website (Veterans Affairs Medical Center SLUMS examination) which is available at https://www.slu.edu/medicine/internal-medicine/geriatric-medicine/aging-sucessfully/pdfs/rapid-cognitive-screen.pdf. RCS includes 3-items from the Veterans Affairs Saint Louis University Mental Status (SLUMS) exam: recall of 5 words, a clock drawing test, and the ability to remember a story (12). RCS scores range from 0=worst to 10=best, including memory (5 points), clock drawing (4 points; 2 points for hour markers, 2 points for time), and story (1 point). The RCS optimal cut-off scores were ≤ 5 for dementia and ≤ 7 for MCI (17) and Turkish version of RCS test (RCS-T) is derived from the SLUMS-T in the present study (16).

Patient exclusion criteria

Patients with severe deafness and blindness and those considered to be too sick to be questioned, including those in delirium were excluded. Those who had been taking medications that might affect their memory or thinking, who reported previous head injury resulting in unconsciousness and/or a period of memory impairment, who were unable to provide informed consent, and who were illiterate were excluded.

Statistical Analyses

Statistical Package for Social Sciences (SPSS) version 23.0 for Windows (SPSS Inc, Chicago, IL), the package program was used for the statistical analysis. Descriptive statistics are reported as means ± standard deviations or percentages. In the three groups, differences were tested either 1-way analysis of variance or Kruskal-Wallis test because of the distributional characteristics. The relationship among the parameters was analyzed by Spearman's correlation analysis. P-value <.05 was considered significant. In order to test the predictive accuracy of the RCS-T for detecting MCI and AD and to set an appropriate cut-off point for the test, the area under curves of receiver operating characteristic (ROC) analysis was used. Sensitivity, specificity, and positive and negative predictive values (PPV and NPV) of RCS-T were calculated to detect CI. A sample size of 144 participants was calculated to ensure that the minimum required size was within a 95% confidence interval and 5% of the true proportion.

Results

Descriptive characteristics of 323 patients (200 female/123 male), of whom the mean age was 72.2±7.4 years, are demonstrated in Table 1. The mean number of years of education was 8.47 years with SD of 3.9. There was no difference in the patients with MCI, AD, and control groups with regard to total years of education or educational level of the participants (for each p> .05). There was a significant difference between the 3 groups in terms of gender and age; more female participants in AD and control groups (P< .05) and older patients in AD group (p< .001).

217 subjects were cognitively normal, whereas 54 patients were diagnosed with MCI (16, 7%) and 52 (16%) patients were diagnosed with AD. Comparing those with cognitively normal, MCI and AD groups, it was determined that while the mean age increased, the scores of MMSE, SLUMS, BADL, IADL, clock-drawing test decreased (p< .001, for each) (Table 1).

To establish the validity of RCS, the association between RCS and MMSE, CDR and SLUMS scores was calculated. The total RCS-T scores were positively correlated with the MMSE scores (r = 0.647, P < .001), positively correlated with the SLUMS-T scores (r = 0.864, p< .001) and negatively correlated with the CDR scores (r = -0.719, P < .001). Also, total RCS-T scores were positively correlated with the basic activities of daily living (BADL) index and the instrumental activities of daily living (IADL) scale scores (r=0.346 and r=0.507, respectively; p < .001 for both). The duration of the RCS-T was 2.08 ± 1.1 minutes.

Table 1
Demographic Characteristics of Participants (n=323)

	Control (n=217)	MCI (n=54)	AD (n=52)	P Value
Women (%)	66.8	49.1	54.7	0.029
Age	72.5±7.1	76.5±6.2	78.7±7.1	<0.001
Education (year)	8.6±3.8	7.7±3.7	8.4±4.2	0.226
Education level (%)				
0-8 years	52.1	62.3	56.9	0.388
≥9 years	47.9	37.7	43.1	
Number of drugs	5.3±3.3	5.5±2.9	6.04±3.1	0.2
MMSE (0-30)	28.2±1.6	25.7±3.01	18.6±4.5	<0.001
SLUMS (0-30)	25.1±3.1	19.9±4.1	11.1±4.6	<0.001
CDR (0-3)	0.0±0.0	0.5±0.0	1.5±0.6	<0.001
CDT (0-5)	4.7±0.6	4.3±1.1	2.1±1.3	<0.001
YGDS (0-15)	2.8±3.4	3.2±3.4	3.7±3.1	0.119
BADL (0-100)	95.6±5.8	93.8±13.0	84.9±15.7	<0.001
IADL (0-17)	14.4±2.6	13.08±3.4	7.6±4.4	<0.001

AD, Alzheimer's disease; MCI, Mild Cognitive Impairment; MMSE, Mini-Mental State Examination; SLUMS, Saint Louis University Mental Status Examination; CDR, Clinical Dementia Rating; CDT, Clock Drawing Test; YGDS, The Yesavage Geriatric Depression Scale; BADL, Basic Activities of Daily Living; IADL, Instrumental Activities of Daily Living.

Table 2
Discriminant validity of the RCS-T for AD, CI and MCI

	Cut-off	Sensitivity (%)	Specificity (%)	PPV(%)	NPV(%)
AD	≤4	84.62 (%)	91.14 (%)	64.71 (%)	96.86 (%)
CI	≤6	85.85 (%)	87.56 (%)	77.12 (%)	92.68 (%)
MCI	≤6	73.58 (%)	87.56 (%)	59.09 (%)	93.14 (%)

AD, Alzheimer's disease; CI, Cognitive Impairment; MCI, Mild Cognitive Impairment; PPV, Positive predictive value; NPV, Negative predictive value.

The sensitivity and specificity, and positive predictive values and negative predictive values of RCS-T for cut-off point of 6 and 4 for each group were presented in Table 2. The area under the receiver-operating characteristics curve (95% confidence interval) was 0.96 for AD, 0.92 for CI and 0.856 for MCI (Figure 1). The Cronbach's Alpha value, which indicates the internal consistency of RCS-T, was found to be 0.674 for AD and 0.713 for CI.

Discussion

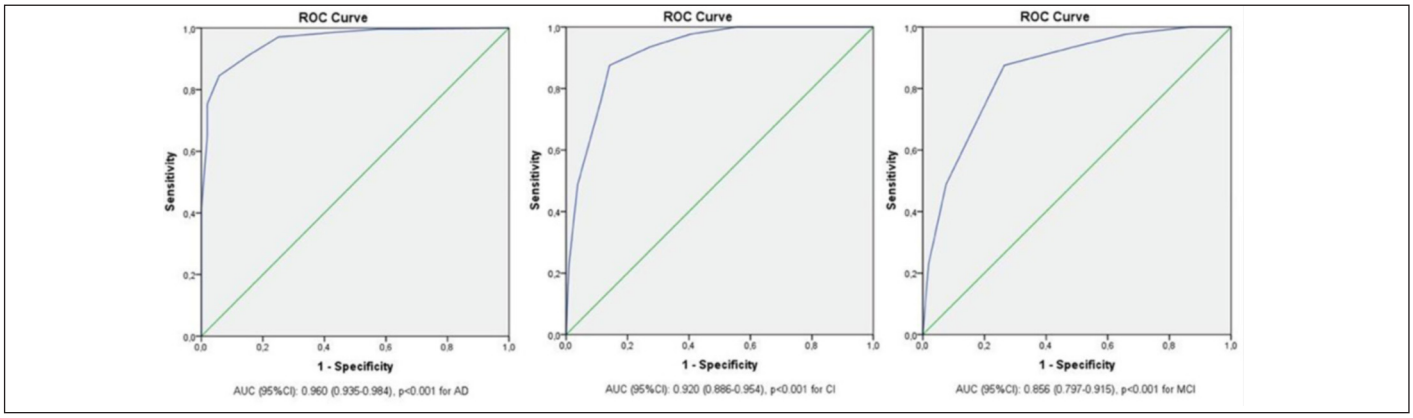
The present study demonstrated that RCS-T, a rapid, valid and reliable instrument to evaluate CI in older adults, is also a practical and brief screening tool and highly sensitive for CI.

Cognitive decline is a term to define any characteristic that acts as a barrier to the cognition process (22). Subjective memory complaints are common in the elderly population (23). In a previous study, it was demonstrated that the prevalence of subjective forgetfulness between the ages of 55-64, and the ages of 70-85 was 41% and 52% respectively (24). A clinician must differentiate dementia from age-associated cognitive decline, but CI, such as MCI and AD, in older adults may not be so easy to diagnose, especially in the early stages (25), which requires a cognitive assessment of the patient. However, it may not always be possible to assess patients in this respect because of time limitations in the primary care and lack of education of physicians.

Therefore, brief, valid and easy-to-administer cognitive screening tests are crucial for making a differential diagnosis and considering the early clinical signs of specific neurodegenerative diseases as evidence of dementia. Furthermore, it should be kept in mind that it may also help primary care professionals or physicians determine whether it is necessary to refer a patient to a tertiary care physician or a medical center for cognitive diseases. For this purpose, it was demonstrated in the previous studies that less time-consuming, cheaper, and more reliable clinical approaches, including the "Applause sign", "Attended With" and "Head-Turning" signs and screening tools such as RCS, might be decisive indicators for the detection of CI in older adults with forgetfulness (9, 17, 26, 27). Since the RCS is a rapid, easy-to-administer and score, and a useful screening instrument for detection of CI in busy clinical settings, we aimed to establish the validity and reliability of the RCS-T in patients with impaired cognitive status.

Actually, RCS, not a new test for medical literature, was derived from the SLUMS by Malmstrom et al (17) for rapid evaluation of CI in elders, and they reported that the sensitivity and specificity of RCS with optimal cut-off scores of ≤ 5

Figure 1
Receiver operating characteristic curve (ROC) analysis of the RCS-T



AD, Alzheimer's disease; AUC, area under the curve; CI, Cognitive Impairment; CI, confidence interval; MCI, Mild Cognitive Impairmen

for dementia were 0.89 and 0.94, respectively, and ≤ 7 for MCI were 0.87 and 0.70, respectively. Likewise, RCS-T was also derived from SLUMS-T in this study, and was found to show similar sensitivity and specificity to RCS (17) for AD. Nevertheless, we found that RCS-T for MCI had a higher specificity (87.56%), but a lower sensitivity (73.58%) than that of RCS. The educational differences can explain why the sensitivity and specificity of RCS-T are different from Malmstrom's study (17), since the number of higher educated patients in the original study population (12) (69.4%) was approximately 1.5 times more as much as that of our study population (45.2%). Besides, another different feature of our study was that DSM V diagnostic criteria were used instead of DSM IV for CI.

The RCS-T has strong power to exclude older adults with CI. In other words, RCS-T might be a diagnostic tool to decide whether to refer the patient to a medical center for cognitive diseases. Other potential advantages are that RCS-T has short duration time and good correlation with IADL and BADL. Therefore, RCS-T, simple, time-effective, and sensitive enough to screen for CI in geriatric outpatient clinics, might also be thought that RCS-T is helpful for primary care and bedside consultation practice for older adults.

The strengths of this study are that all the cases included in the study were over 60 years of age, which was a larger sample size. This study also has some limitations, since it was conducted at a memory center; therefore, our results might not be generalizable for a wider population. Another limitation is that the patients with MCI and AD were included, but the other patients with types of dementia were excluded.

Conclusions

Our results suggest that the RCS-T, a simple, quick, practical and sensitive tool for screening CI, reflects deterioration in activities of daily living in older adults. Therefore, the RCS-T seems to be a useful screening test for older patients with CI in a bedside consultation and primary care practice.

Ethics approval and consent to participate: The study protocol was approved by the ethic committee of the Dokuz Eylul University School of Medicine of Izmir/Turkey and follow the principles of the 1964 Helskinki declaration, and written informed consent was obtained from all participants.

Disclosures and Author Responsibilities: Dr. SKO has nothing to disclose. Dr. OD has nothing to disclose. Mrs. CU has nothing to disclose. Dr. PS has nothing to disclose. Dr. ATI has nothing to disclose. Author responsibilities were as follows. SKO: analyzed the data and wrote the paper. OD: performed the statistical analysis. CU: collected the data. PS: performed data analysis and manuscript writing. ATI: designed the study, analyzed the data and wrote the paper.

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