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The AD8 (Dementia Screening Interview) is a valid and reliable screening scale not only for dementia but also for mild cognitive impairment in the Turkish geriatric outpatients

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ABSTRACT

Introduction: There is still a need for short, practical, and daily-appropriate scales to distinguish between normal cognitive aging, mild cognitive impairment (MCI), or dementia for patients with memory complaints. This study aimed to determine validity and reliability of AD8 (Dementia Screening Interview) to detect both MCI and dementia in Turkish geriatric outpatients.

Methods: Comprehensive geriatric assessment was performed in 334 patients, who attended with their informants to the geriatric outpatient clinic for memory complaints. In addition to the AD8, they were screened using Clinical Dementia Rating scale (CDR) and Mini-Mental State Examination. The diagnosis of dementia and MCI was made according to the *Diagnostic and Statistical Manual of Mental Disorders* - fifth edition (DSM-5) criteria.

Results: The mean age of the patients was 74.5±8.5. Of them, 156 were considered as non-cognitive impairment, 60 as MCI, and 118 as dementia. Cronbach's α value of the AD8 was 0.928. The total AD8 scores were found to be negatively correlated with the MMSE scores ($r = -0.801$), and positively correlated with CDR score ($r = 0.879$) ($p < 0.001$, for each). The area under the receiver-operating characteristics curve was 0.979 for cognitive impairment, and 0.999 for dementia. We found that AD8 can show dementia and MCI when the cut-off values are ≥5 and 3–4, respectively, with a sensitivity of 100% and 81.67% and specificity of 96.3% and 93.59%.

Conclusion: AD8 is one of the fast, simple, and sensitive screening methods for detecting both minor and major cognitive impairments. With regard to these features, it can be used in older adults attending the primary care settings with memory complaints.

Key words: cognitive assessment, cognitive impairment, dementia, scales, screening

Introduction

Memory complaints and cognitive dysfunction are quite common among old people (Isik, 2010). Dementia is characterized by cognitive dysfunction, including two or more cognitive domains (learning and memory, language, executive function, complex attention, perceptual motor, and social cognition) (APA, 2013). The deficits must represent a decline from previous level of function and be severe enough to interfere with daily function and independence (Isik, 2010; APA, 2013). Although dementia is not a natural part of the aging process, it often affects older adults (Logiudice and Watson, 2014). The global prevalence of dementia that increases with age ranges from 5% to 7% in individuals over 60 years of age and is up to 20% in people over 85 years of age (Prince *et al.*, 2013).

In older adults, memory complaints are also common and are not always associated with dementia (Singh-Manoux *et al.*, 2014). It is not possible to make detailed cognitive evaluation to all individuals who are admitted with subjective or objective memory complaints. A large number of studies show that cognitive impairment is unrecognized in 27%–81% of affected patients in primary care (Cordell *et al.*, 2013). As mentioned in our previous studies (Soysal *et al.*, 2017; Isik *et al.*, 2018), detailed medical history,

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physical examination, and neurocognitive assessment should be performed to identify the etiology of memory complaints. However, comprehensive neurocognitive assessment, including memory, language, executive functions, visuospatial functions, attention, place–time orientation and behavioral disorders, mood, and activities of daily living may not be performed in every clinic, as it takes too much time and requires special training. Therefore, the use of short, easily applicable, time-saving, and cost effective dementia screening scales, such as AD8, has allowed identifying the individuals who require further evaluation among the patients who apply to especially primary care settings for memory complaints.

Washington University Dementia Screening Interview, also known as Aging and Dementia-8 (AD8), was developed to determine the difference between normal cognitive aging and early-stage dementia. A short and intelligible test, AD8 is an easy scoring method that can be performed by the patient, by caregivers, or by practitioners (Galvin *et al.*, 2006; Galvin *et al.*, 2007a, 2007b). AD8 etiologically detects early manifestations of dementia in people according to personal differentiation in eight different functions measuring memory, orientation, judgment, and executive function (Galvin *et al.*, 2005). AD8, proven to be a simple, short, and less time-consuming questionnaire (mean test time 3 minutes), is culturally sensitive that is shown to be an appropriate scale for primary health care, annual health visits, and research (Galvin *et al.*, 2006, 2007a, 2007b). Furthermore, it was shown that this test also can be easily and quickly applied in some special units like emergency (Carpenter *et al.*, 2011). The sensitivity and specificity of AD8 have been demonstrated to be high in validity-reliability studies conducted in recent years in different countries (Li *et al.*, 2012; Dong *et al.*, 2014).

Therefore, the present study aimed to establish the validity and reliability of the Turkish version of the AD8 in outpatients with cognitive impairment and to investigate the discriminative power of the test in older patients with minor or major cognitive impairment from non-cognitive impairment.

Method

Procedure

In total, 334 geriatric cases over the age of 60 who were admitted to Dokuz Eylul University, Department of Geriatrics between October 2015 and December 2016 for memory complaints were included in the study. Demographic characteristics (age, gender, educational status, and marital status) and detailed geriatric evaluation were recorded. In detailed geriatric evaluation, The Clinical Dementia Rating scale (CDR) (Morris, 1993), The Montreal Cognitive Assessment scale (MOCA) (individuals who were educated for nine years or more) (Nasreddine *et al.*, 2005), the Mini-Mental State Examination (MMSE) (individuals who were educated for five to eight years) (Folstein *et al.*, 1975), Cognitive Status Test (COST) (individuals who were educated four years or less, or illiterate) (Babacan-Yildiz *et al.*, 2013) and the Clock Drawing Test (Shulman, 2000) were used for neurocognitive assessment; The Yesavage Geriatric Depression Scale (YGDS) (Durmaz *et al.*, 2018; Dokuzlar *et al.*, 2018) for emotional state assessment; and The Lawton-Brody Instrumental Daily Living Activity Scale (IADL) (Lawton and Brody, 1969) and Barthel index (BI) (Mahoney and Barthel, 1965) for daily living activities.

Translation procedure

The process of Turkish translation of the AD8 (Dementia Screening Interview) included the following steps: (1) the first stage was to obtain a translation permission from the authors of the original scale, (2) three independent translations into Turkish were done by three native linguistic specialists. All the translators were blind to each others translation; (3) then, the translations were analyzed by another researcher who was fluent in English, and turned into a single text; (4) this consensus forward version was back translated into English by two native linguistic specialists; the backward version and the original text were compared with English translation. None of the items of the Turkish text needed any modifications following this stage. (5) The final text was applied to ten patients, in order to test whether there was a problem in practice, and no problem was detected.

Measures

The diagnosis of major and minor cognitive impairments was made according to the diagnostic and statistical manual of mental disorders - fifth edition (DSM-5) diagnostic criteria by a geriatrician (APA, 2013), and major and minor cognitive impairments were regarded as dementia and mild cognitive impairment (MCI), respectively. Healthy individuals without cognitive impairment were included in the control group according to DSM-5 diagnostic criteria. Brain imaging was performed on every patient with dementia or MCI, and possible intracranial pathologies were ruled out.

After these evaluations, according to the cognitive status of the patient; the patient's caregiver (spouse, child, etc.) or informants were administered AD8. For each item of the scale, we asked "In the areas I am going to say, has there been any change in the cognitive (thinking and memory) sense in the last few years?" and a response is given to the three scoring categories: (1) Yes, a change, (2) No, no change, and (3) N/A, do not know. A score of 1 (one) for each "Yes, a change" and 0 (zero) for "No, no change" and "Do not know" answer was given.

The study was consonant to the Declaration of Helsinki, and was approved by the local ethics committee.

Exclusion criteria

The patients who attended alone were excluded. After detailed patient history and medical record review, patients who were in delirium that was assessed by a geriatrician using the confusion assessment method (Inouye *et al.*, 1990), who were diagnosed previously with psychotic disorder and who were considered to be likely to psychotic disorders, had acute disease within the last two weeks (infections, acute coronary syndrome, acute cerebrovascular accident, and gastrointestinal hemorrhage or staying in the intensive care unit etc.), and had been using drugs likely to influence emotional state such as benzodiazepine and antipsychotics, and alcohol and substance addicts, and patients who do not know Turkish were excluded.

Statistics

Statistical analyzes were performed by IBM SPSS Statistics V15.0 (Statistical Package for the Social Sciences) and PASS (Power Analysis and Sample Size) 2008 Statistical Software (Utah, USA). For the study data evaluation, parametric values were expressed as mean ± standard deviation (SD), data obtained from scoring systems as median, and categorical data as percentage. The *t*-test in the presence of normal distribution was used to compare parametric values, whereas Mann–Whitney U test and Wilcoxon test were used to assess the presence of non-normal distribution. Logistic regression analysis was used in the analysis of multiple variables, and the χ^2-test was used in the evaluation of categorical data. To evaluate the relation between parameters, Pearson correlation analysis was used and the significance was evaluated at $p < 0.05$ level. The correlation scores of AD8 total scores with cognitive screening test scores and daily life activities scale scores were assessed by Spearman correlation test. In order to test the predictive accuracy of the AD8 for detecting MCI and demands and to set an appropriate cut-off point for the test, area under curves of receiver operating characteristic (ROC) analysis was used. A sample size of 145 participants was calculated to ensure that the minimum required size was within a 95% confidence interval (CI), with the margin of error being at most 5%.

Results

In the present study, a total of 334 participants were evaluated. The mean age (SD) of the cases was 74.5 (8.5), with 217 (65.7%) being female, and the mean of the education year (SD) was 9.3 (4.65). In total, 156 (46.7%) patients were cognitively normal (control group), 60 (18%) were with MCI, and 118 (35.3%) were with dementia. A comparison of all demographic characteristics of participants in control, MCI, and dementia group is shown in Table 1.

There was no statistically significant difference between the groups in terms of YGDS score ($p > 0.05$). It was found that cognitive impairment was significantly associated with advanced age, female gender, and low education level ($p < 0.05$).

When the patients with cognitive impairment were compared in terms of cognitive functions and activities of daily living, while the AD8 total scores increased, the MMSE, COST, MOCA, BADL, IADL, and CDT scores decreased and CDR stages were also found to be increased ($p < 0.05$ for each). There was a significant negative correlation ($r = -0.801, -0.758, -0.736, -0.774, -0.757, -0.663$) between AD8 total scores and MMSE, COST, MOCA, CDT, IADL, and BADL scores and a positive correlation with CDR scores ($r = 0.879$) ($p < 0.001$), respectively. The mean duration of test (SD) was 2.4 (1.1) minutes.

The mean values of AD8 total scores (SD) in control, MCI, and dementia groups were 1.36 (1.81), 3.40 (1.18), and 7.70 (0.81), respectively, which were significantly different between the groups ($p < 0.001$). The Cronbach's α value, which indicates the internal consistency of AD8, was found to be 0.928. The κ values of each of the AD8 substances in subjects with cognitive impairment are shown in Table 2. According to this table, AD8 was found to provide the highest contribution to the screening of items 1 and 6, respectively. In Figure 1, ROC curves between dementia and non-dementia group, cognitive impairment and control group, and MCI and control group are shown according to clinical diagnosis. Also, Table 3 shows the sensitivity, specificity, positive predictive value

Table 1. Demographic characteristics of participants ($n = 334$)

	CONTROL ($N = 156$)	MCI ($N = 60$)	DEMENTIA ($N = 118$)	P
Women (%)	70.3	44.9	70.3	**<0.001**
Age	71.3±7.5	73.6±7.3	79.2±8.3	**<0.001**
Education (year)	11.6±2.8	9.4±4.1	5.9±4.7	**<0.001**
Education level (%)				
0–5 years	2.0	36.7	64.4	**<0.001**
6–11 years	54.4	31.7	24.6	
≥12 years	43.6	31.7	11	
Married (%)	62.4	71.7	43.2	**<0.001**
MMSE (0–30)	27.9±1.5	25.8±3.2	13.1±7.7	**<0.001**
COST (0–30)	28.1±1.6	26±1.6	17.1±6.9	**<0.001**
MOCA (0–30)	25.5±2.3	22.7±4.1	13.1±5.5	**<0.001**
CDT (0–5)	4.7±0.5	4.1±1.1	1.2±1.5	**<0.001**
YGDS (0–15)	2.6±3.1	2.5±2.8	2.4±2.3	0.744
BADL (0–100)	96.8±4.8	94.5±9.2	68.5±26.5	**<0.001**
IADL (0–17)	15.6±2.2	13.7±3.1	5.4±4.2	**<0.001**

MCI: mild cognitive impairment, MMSE: Mini-Mental State Examination, COST: Cognitive Status Test, MOCA: The Montreal Cognitive Assessment scale, CDT: Clock Drawing Test, YGDS: The Yesavage Geriatric Depression Scale, BADL: Basic Activities of Daily Living, and IADL: Instrumental Activities of Daily Living.

Table 2. The kappa values for each items of AD8

ITEM	QUESTIONS	P
1.	Problems with judgment (e.g., problems making decisions, bad financial decisions, and problems with thinking)	0.756*
2.	Less interest in hobbies/activities	0.584*
3.	Repeats the same things over and over (questions, stories, or statements)	0.641*
4.	Trouble learning how to use a tool, appliance, or gadget (e.g. VCR, computer, microwave, and remote control)	0.688*
5.	Forgets correct month or year	0.669*
6.	Trouble handling complicated financial affairs (e.g. balancing checkbook, income taxes, and paying bills)	0.727*
7.	Trouble remembering appointments	0.635*
8.	Daily problems with thinking and/or memory	0.532*

*$p < 0.001$.

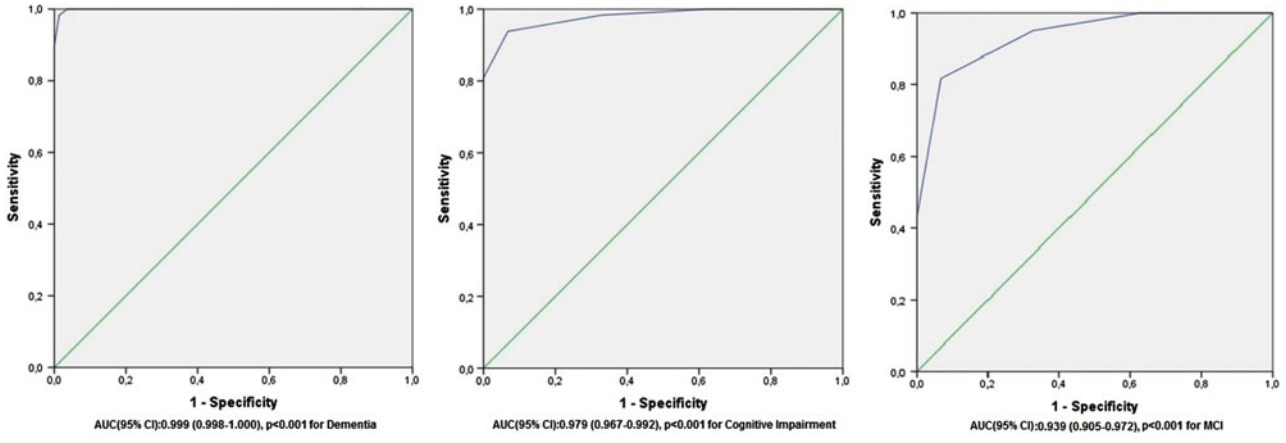

Figure 1. (Colour online) Receiver operating characteristic curve (ROC) analysis of the AD8.

Table 3. Discriminant validity of the AD8 for dementia, cognitive impairment, and mild cognitive impairment

	CUT-OFF	SENSITIVITY (%)	SPECIFICITY (%)	PPV (%)	NPV (%)
Dementia	≥5	100 (%)	96.3 (%)	93.65 (%)	100 (%)
Cognitive impairment	≥3	93.82 (%)	93.59 (%)	94.35 (%)	92.99 (%)
MCI	≥3	81.67 (%)	93.59 (%)	83.05 (%)	92.99 (%)

PPV: positive predictive value; NPV: negative predictive value, and MCI: mild cognitive impairment.

(PPV), and negative predictive value (NPV) in determining dementia, cognitive impairment, and MCI when the most appropriate cut-off values were taken according to the ROC curves of AD8.

Discussion

This study has shown that AD8 is a valid and reliable instrument for detecting minor and major cognitive impairments in the Turkish geriatric outpatients. This study has also shown that AD8 has the discriminative power for dementia, MCI, and control groups with high sensitivity and specificity.

Forgetfulness and cognitive impairment are common problems in older adults (Fritsch *et al.*, 2014). Although the prevalence of forgetfulness and subjective memory complaints varies, in community-based studies, it ranges from approximately 25% to 50% in many studies (Jonker *et al.*, 2000; Singh-Manoux *et al.*, 2014). In the Maastricht Aging Study, it was demonstrated that complaint of forgetfulness, between the ages of 55 and 64, and the ages of 70 and 85 was 41% and 52%, respectively (Ponds *et al.*, 1997). In older patients who are referred to clinics for their forgetfulness, memory-related changes may be a feature of aging, called "benign senescent forgetfulness" or may be a sign of a neurodegenerative process at different levels, such as mild cognitive impairment or dementia (Heinik, 2010; Annoni *et al.*, 2016). To make differential diagnosis of forgetfulness in older adults, a detailed evaluation, including anamnesis, examination, and neurocognitive tests, is needed (Annoni *et al.*, 2016). Despite plenty of neurocognitive tests, there is not any gold standard test to determine cognitive impairment. MMSE, one of those tests, is the most commonly used scale in the world, but it has some limitations (Folstein *et al.*, 1975). These limitations include being time consuming, false negative results in those who do not have good use of language, differences in cut-off values according to educational level, low success in detecting MCI patients, and false negative results for different dementia types such as frontotemporal dementia (Tariq *et al.*, 2006). Due to the aforementioned limitations of cognitive screening tests, it is necessary to develop an easy-to-apply, low-cost test to identify individuals who need further evaluation to prevent unnecessary examinations who are admitted to primary care unit for forgetfulness. For this purpose, it was demonstrated in our previous studies that less time-consuming, cheaper, and more reliable clinical approaches, including the "Applause sign", "Attended With" and "Head-Turning" signs, might be decisive indicators for the detection of cognitive impairment in older adults with forgetfulness (Soysal *et al.*, 2017; Isik *et al.*, 2018).

AD8 Dementia Screening Test developed for the similar purpose is a short and straightforward one (Galvin *et al.*, 2005) that can be performed by the patient, caregiver, or a practitioner in the primary health care with an easy scoring method to determine the difference between normal cognitive aging and early-stage dementia signs. In previous studies, it was reported that the mean test time was about 3 minutes. In this study, the mean duration of test was 2.4 minutes, as compatible with literature (Malmstrom *et al.*, 2009; Shaik *et al.*, 2016). We have thought that education and socio-cultural structure of the subjects may affect the variation in test time.

Galvin *et al.* (2005) found that the sensitivity (74%) and specificity (86%) were high in the general population, when 2 and over is the cut-off point in which they made and applied the AD8 screening test. The normal cognition score was 0–1, and 2 and over scores were the indicators of cognitive impairment (Galvin *et al.*, 2005). After this study, in many countries, cut-off point 2 was confirmed, and AD8 was found to be a screening tool with adequate validity for older adults with cognitive impairment (Ryu *et al.*, 2009; Yang *et al.*, 2011; Xie *et al.*, 2014). In studies conducted in different countries and cultures, different cut-off points 1 and over (Chin *et al.*, 2013), and 1–2 (Meguro *et al.*, 2015) were reported. In a study conducted by Perdo *et al.* (2013), it was found that the sensitivity was 0.93 and the specificity was 0.81 when the cut-off point was 3–4. In the present study, it was shown that AD8 can diagnose with the

dementia when total score is ≥5, and that MCI can be diagnosed when total score is ≥3. In the light of these results, it may be stated that in AD8, ≤2 point indicates normal cognitive function, 3–4 points indicate MCI, and ≥5 points indicate dementia with high sensitivity and specificity. While detecting cognitive deficits, it is important to distinguish MCI from dementia and the normal cognitive functions, as there is no treatment for MCI that stops or reverses, but it is significant that several risk factors, which might affect on progression of MCI, may slow the progression of cognitive impairment (Petersen *et al.*, 2014). Furthermore, recent studies showed that anti-dementia drugs did not have a positive effect on slowing the progression of MCI, and they caused many side effects with expectance of unproven benefits (Petersen *et al.*, 2014; Soysal and Isik, 2016; Soysal *et al.*, 2016).

The strengths of this study are that all the cases included were over 60 years of age, which was a larger sample size. The other strong aspects of the study are that it comprises the patients with only "memory complaint," and that MCI and dementia were diagnosed according to the DSM-5 criteria different from the previous studies. One of the limitations of this study is that the effects of the different sociocultural structure and level of education on the validity and reliability of AD8 have not been evaluated. Patients were divided as with normal cognitive function, with MCI, and with dementia, and no analysis was performed according to dementia subgroups. This study may not represent whole geriatric patients, as it includes only outpatients who attended for a memory problem with an informant.

In conclusion, we demonstrated that the Turkish version of AD8 is a valid and reliable test and is a very practical scale for screening, in order to identify the individuals who need further evaluation to prevent unnecessary examinations in geriatric outpatients. In addition, it was demonstrated that AD8 can diagnose the older adults with MCI and can be used especially in the primary care setting. It should be kept in the mind that AD8 will also reduce the work load of the reference clinics and the health expenditure.

Conflicts of interest

None.

Description of authors' roles

C. Usarel designed the study, collected and analyzed the data, and wrote the paper. O. Dokuzlar analyzed the data and wrote the paper. P. Soysal designed the study and wrote the paper. A.T. Isik designed the study and wrote the paper. A.E. Aydin wrote the paper.

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