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# Discriminant Validity and Reliability of the Turkish Version of Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE-T)

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**Abstract**

The Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE) has been used as a measure of cognitive decline in different cultures. The purpose of the study was to establish the validity and reliability of the Turkish version of IQCODE (IQCODE-T) and the ability of the questionnaire to distinguish between older adults with DSM-IV-TR dementia ($n = 100$) and healthy control participants ($n = 60$). In addition, the power of the IQCODE-T to distinguish between patients with depression and dementia was investigated. The Mini-Mental State Examination (MMSE) was performed on all participants and the IQCODE-T was administered to their informants. The IQCODE-T, which was not associated with age or education of the patients, significantly differentiated patients with dementia and controls. The IQCODE-T also correctly classified 73% of depressed patients as "non-demented". Because it is easy to administer, not associated with age/education and yields fewer false-positive results than the MMSE in depression, the IQCODE-T can be used in the detection of dementia.

*Keywords:* Dementia; IQCODE; Reliability; Validity; Cognitive functions

## Introduction

The diagnosis of dementia has been of great concern, as the rate of the aging population increases throughout the world (Federal Interagency Forum on Aging Related Statistics, 2008; Turkish Statistical Institute, 2008; World Health Organization, 2008). A recent study reported that the prevalence of dementia at an urban area in Turkey was comparable with the rates in Western countries (Gurvit et al., 2008). However, low-education status of older adults in Turkey compromises the usage of neurocognitive instruments in the screening of dementia. Therefore, informant-based information is highly valued in clinical practice. The Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE), which was developed by Jorm and Jacomb (1989), has been widely used as a way of measuring cognitive decline from a premorbid level using informant reports in older adults. Compared with different cognitive screening tests for dementia, the IQCODE has the advantage of being unaffected not only by age and education, but also by physical disabilities and the premorbid ability of the patient (Jorm, Scott, Cullen, & MacKinnon, 1991). Jorm (1996) has highlighted that informant questionnaires such as the IQCODE perform as well as brief cognitive screening measures. Therefore, the IQCODE has been translated to many languages and validated in different cultures (de Jonghe, 1997; Fuh et al., 1995; Isella, Villa, Frattola, & Appollonio, 2002; Morales et al., 1997; Senanarong et al., 2001; Siri, Okanurak, Chansirikanjana, Kitayaporn, & Jorm, 2006). IQCODE is preferred over other informant-based instruments like Concord Informant Dementia Scale (Waite et al., 1998) or AD8 (Galvin, Roe, Xiong, & Morris, 2006) because it has been validated in a large number of studies across different cultures and languages and in populations with lower dementia prevalence rates than those used to validate the Concord Informant Dementia Scale (Cherbuin, Anstey, & Lipnicki, 2008).

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At clinical settings, it is also hard to differentiate mild stages of dementia and late life depression because both situations may have similar clinical presentations (Zapotoczky, 1998). Furthermore, some brief neurocognitive tests, like the Mini-Mental State Examination (MMSE), seem to yield false-positive results in older patients with depression (Fossati et al., 2004; Lesser et al., 1996; Lichtenberg, Ross, Millis, & Manning, 1995). There are some studies examining the validity of neuropsychological tests in the differentiation of depression from dementia in older patients (des Rosiers, Hodges, & Berrios, 1995; Foldi, Brickman, Schaefer, & Knutelska, 2003; Swainson et al., 2001). However, not much is known about the discriminative power of the informant-based questionnaires in the differentiation of dementia and depression. There is only one study examining discriminative power of the IQCODE in a clinical sample (de Jonghe, 1997). In this study, de Jonghe found that the Dutch version of the IQCODE with a cut-off point of 3.9 correctly classified 87.8% patients with DSM-III-R dementia ($n = 49$) and 78.8% patients with other psychiatric disorders ($n = 33$) like schizophrenia or mood disorders. The Dutch version of the IQCODE correctly classified a considerable number of patients with other psychiatric disorders; however, no further information about their clinical diagnoses exists in the paper.

The present study aimed to establish the validity and reliability of the Turkish version of the IQCODE (IQCODE-T) in patients with dementia. Our secondary goals were to investigate the discriminative power of the IQCODE-T in older patients with depression and mild dementia. In addition, we aimed to explore whether the IQCODE-T was affected by the age or the education of the patient as is the case with the MMSE and other neurocognitive measures.

## Materials and Methods

The sample consisted of the informants of all outpatients with DSM-IV-TR (American Psychiatric Association, 2000) dementia ($n = 100$) and DSM-IV-TR major depressive disorder ($n = 60$) who were consecutively admitted to the geropsychiatry clinic of a university hospital from January 2006 through July 2007. The diagnostic evaluation for depression and dementia was performed by two experienced psychiatrists (ETO-K and EDT) who were blinded to the IQCODE-T and the MMSE scores. The diagnostic evaluation of dementia consisted of detailed history taking, mental status, and neurological examination, as well as routine blood tests and neuroimaging. MMSE consisted of some bedside tests tapping different cognitive functions: Orientation to time, place and person, forward and backward digit span for attention, a short word list learning with delayed recall and recognition for memory, a short list for confrontation naming, verbal fluency (both categorical and lexical) for language, a number of gestures for praxis, imitating hand and finger positions, copying geometrical shapes for visuospatial abilities, Luria's alternating patterns for set shifting, proverb interpretation and similarities for abstraction, general information about current events, and some situational questions for reasoning. In addition to these tests, Functional Activities Questionnaire was administered for the assessment of daily functioning (Pfeffer, Kurosaki, Harrah, Chance, & Filos, 1982; Selekler, Cangöz, & Karakoç, 2004). Sixty patients were diagnosed as having dementia of the Alzheimer's type, 13 patients as having vascular dementia, 20 patients as having mixed type of dementia, and 7 patients as having dementia due to other etiologies. Patients with neurological or psychiatric disorders other than dementia or depression were excluded. The control group ($n = 60$) consisted of healthy volunteers without any psychiatric or neurological disease. They were the relatives of the undergraduate students at the Department of Psychology. Having a close relationship with the participant for at least 10 years, not having a significant neurologic or psychiatric disease and having at least 5 years of education were the inclusion criteria for the informants.

The IQCODE-T was administered before the clinical evaluation and 1 week after the initial examination for investigating test–retest reliability. The IQCODE-T data were gathered by intern doctors who were blinded to the diagnosis, as well as the previous IQCODE-T and MMSE ratings. A total of 59 informants (27 were the informants of patients with dementia, 18 were the informants of the patients with depression, and 14 were the informants of control subjects) completed the retest. Others were unreachable after 1 week.

In order to examine convergent validity, the MMSE (Folstein, Folstein, & McHugh, 1975) was administered to all participants. The Turkish version of MMSE has two parallel forms for literate and illiterate people. Both scales have been validated in Turkish population (Ertan, Eker, & Gungen, 1999; Gungen, Ertan, Eker, Yasar, & Engin, 2002). Participants who cannot complete the MMSE due to physical disabilities or other reasons were excluded. The Geriatric Depression Scale (GDS; Ertan & Eker, 2000; Yesavage et al., 1983) was administered to the patients with depression and controls for the assessment of depressive symptoms. Control subjects with GDS scores higher than 14 (which was the cut-off point suggested by Ertan & Eker, 2000) were excluded from the study. The Cornell Scale for Depression in Dementia (CSDD) was used to assess depressive symptoms in patients with dementia (Alexopoulos, Abrams, Young, & Shamoian, 1988; Amuk, Karadag, Oguzhanoglu, & Oguzhanoglu, 2003). Patients with CSDD scores higher than 7 were excluded from the study. Clinical Dementia Rating (CDR) Scale (Morris, 1993) was administered to the patients with dementia by psychiatry trainees in order to document the severity of cognitive impairment and compare the IQCODE-T scores of the patients at different CDR stages. Patients at CDR stage 0.5 (who

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had questionable dementia) were excluded for the accuracy of dementia diagnosis. Forty-three dementia patients were at CDR stage I (mild), 43 patients were at CDR stage II (moderate), and 14 patients were at CDR stage III (severe).

The IQCODE is an informant report scale that consists of 26 items. Items are rated for change over the past 10 years from 1 ("much better") to 5 ("much worse"). The original scoring involved summing the items and dividing by the number of completed items to derive a score from 1 to 5. In the original research with the questionnaire, up to three missing values were allowed for the IQCODE. However, some of the studies have allowed up to five or six missing responses (Law & Wolfson, 1995; Lim, Lim, Anthony, Yeo, & Sahadevan, 2003; Tang et al., 2003). In the present study, we allowed for up to six missing responses, because some items like "understanding newspaper or magazine articles, composing a letter to a friend or for business purposes, handling financial matters" cannot be rated in illiterate patients. A total of four IQCODE-T ratings were excluded because more than six items were missing.

For the adaptation of the IQCODE, the questionnaire has been translated from English to Turkish by two psychiatrists who have excellent acquisition of English. Backward translation of the Turkish version was performed by an English linguistics professional. No modifications were done in the adapted version which perfectly fitted with the original IQCODE. We also confirmed that the questions were easily comprehended by administering the IQCODE-T to 10 relatives of patients with dementia at the outpatient clinic. Finally, the IQCODE-T was administered to the study sample.

Between group differences were tested by either one-way analysis of variance or "Kruskal–Wallis test" due to the distributional characteristics. Variance analyses were followed by post hoc tests for pairwise comparisons. Post hoc analysis was performed by "Scheffe or Mann–Whitney *U*-tests." Linear relationships were analyzed by Spearman's correlation test. Intraclass correlation coefficient (ICC) was calculated for the test–retest reliability analysis. Internal consistency was analyzed with "Crobach's $\alpha$ test". In order to test the predictive accuracy of the IQCODE-T for detecting dementia and to set an appropriate cut-off point for the IQCODE-T, area under curves of receiver operating characteristic (ROC) analysis were used. All statistics were carried out in SPSS 15.00.

## Results

### *Socio-Demographic Characteristics of the Groups*

There was no difference between the three groups with regard to gender, total years of education of the participants, or the education of the informants (for each $p > .05$). There was a significant difference between the three groups, $F(2, 217) = 9.91$, $p < .001$, in terms of age. Patients with dementia ($M = 76.1$, $SD = 6.4$) were older than patients with depression ($M = 72.3$, $SD = 4.9$) and controls ($M = 73.1$, $SD = 5.1$; Table 1). Most of the informants were children or the spouses of the participants in each group, and there was no statistically significant difference between the three groups with regard to the type of the informants ($p > .05$; Table 2).

### *Correlations Between Reported Variables and Test Scores*

As there were differences between the groups in terms of age, we analyzed each group separately for the association between age and test scores by using the Pearson correlation coefficient. The IQCODE-T scores were not significantly correlated with age in three groups ($p > .05$). The MMSE scores were not correlated with age in patients with depression and controls ($p > .05$). However, the MMSE scores were negatively correlated with age in patients with dementia ($r = .28$, $p < .01$).

**Table 1.** One-way analysis of variance results for comparison of age of the groups

| | Sum of squares | *df* | Mean square | *F*-value | *p*-value | Significant difference |
|---|---|---|---|---|---|---|
| Between groups | 642.54 | 2 | 321.27 | 9.91 | 0.000 | Dementia > Depression, Control |
| Within groups | 7034.09 | 217 | 32.46 | | | |
| Total | 7676.64 | 219 | | | | |

**Table 2.** Type of informant in each group

| | Dementia ($n = 100$) | Depression ($n = 60$) | Controls ($n = 60$) |
|---|---|---|---|
| Spouses | 32 | 24 | 19 |
| Children | 60 | 36 | 37 |
| Other | 8 | 0 | 4 |

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**Table 3.** Kruskal–Wallis test results for comparison of IQCODE-T scores of the groups

| | *n* | *Di* | *SD* | *H*-value | *p*-value | Post hoc analysis |
|---|---|---|---|---|---|---|
| Dementia | 100 | 153.83 | 2 | 84.29 | 0.001 | Dementia > Depression= Controls |
| Depression | 60 | 73.23 | | | | |
| Control | 60 | 75.88 | | | | |

*Note:* IQCODE-T = Turkish version of the Informant Questionnaire on Cognitive Decline in the Elderly.

The IQCODE-T scores were not correlated with the total years of education of participants in the whole sample ($p > .05$), whereas the MMSE scores were positively correlated with education ($r = .31$, $p < .001$).

### *Validity Analysis*

*Convergent validity.* To establish the convergent validity of IQCODE-T, association between IQCODE-T and MMSE scores was calculated. The IQCODE-T scores were negatively correlated with the MMSE scores of the patients with dementia and controls ($r = -0.57$, $p < .001$).

*Criterion-related validity.* Because the IQCODE-T scores were not normally distributed, nonparametric statistical analyses were used to compare the IQCODE-T scores of the groups. The Kruskal–Wallis test was performed and $\chi^2$ values were analyzed to estimate the significance of group membership on the IQCODE-T scores. The IQCODE-T scores were significantly different in three groups, and the post hoc analysis was carried out by Mann–Whitney *U*-test. The IQCODE-T scores of the patients with dementia were significantly different from the scores of patients with depression and controls. There was no difference between patients with depression and controls in terms of the IQCODE-T scores (Table 3).

The IQCODE-T scores of the patients at different CDR stages were also compared. There was a significant difference in terms of the IQCODE-T scores between the three CDR stages (analyzed by the Kruskal–Wallis test; $H = 22.2$, 2 *df*, $p < .001$). Patients at CDR stage III had lower scores than patients at stage II, and the latter had lower scores than patients at CDR stage I ("mean ranks," *Di* were at CDR stage III = 35.6, at CDR stage II = 58.3, and CDR stage I = 72.1).

*ROC analysis.* IQCODE-T (with a "cut-off point" of 3.4) had a sensitivity of 82% and a specificity of 70% for the diagnosis of dementia. AUC was 0.855 (95% *CI*: 0.798–0.912).

The IQCODE-T (with a cut-off point of 3.4) correctly classified 73.3% patients with depression as "non-demented", whereas the MMSE (with a cut-off point of 24) classified 21.7% of them. IQCODE-T (cut-off point of 3.4) also correctly classified 69.5% patients with CDR stage I dementia (mild dementia) as "demented.".

### *Reliability Analysis*

ICC for the test–retest reliability was found as 0.68. Internal consistency of the IQCODE-T was Cronbach's $\alpha = 0.95$.

## Discussion

It is quite important to validate informant-based instruments, as well as neurocognitive tests, in different cultures and languages for those tests to be scientifically acceptable. This study presents psychometric characteristics of the IQCODE-T, also the discriminative power of the questionnaire in the differentiation of depression from dementia in older patients.

The IQCODE-T discriminated patients with dementia from non-demented participants. Furthermore, the IQCODE-T discriminated between different CDR stages of dementia and the IQCODE-T correctly classified most of the patients with depression and mild dementia. ROC analysis revealed a good predictive accuracy for the diagnosis of dementia; a cut-off point of 3.4 had a sensitivity of 82% and a specificity of 70%. In previous studies, cut-off values 3.4–4.0 were reported in patient samples. However, cut-offs (range 3.3–3.6) were lower in community samples (Jorm, 2004). For the convergent validity, correlation between the IQCODE-T and the MMSE scores of the patients with dementia and controls was examined and a correlation of −0.57 was found. Previous studies have reported a wide range of correlations (−0.37 to −0.78) with the MMSE (Jorm, 2004).

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As we hypothesized, the MMSE yielded more false-positive results in older patients with depression. In a recent study by Walterfang, Siu, and Velakoulis (2006), the MMSE did not differentiate participants with dementia and other psychiatric disorders. Therefore, the MMSE should be used cautiously for detecting dementia at clinical settings.

Although the MMSE scores of the participants were positively correlated with education, the level of education was not associated with the IQCODE-T scores. Morales, Gonzalez-Montalvo, Bermejo, and Del-Ser (1995) found no association between education and the Spanish version of IQCODE scores, either. In addition, some previous studies reported negligible associations with education (Jorm, 2004). Patients with dementia were older than patients with depression and controls. This is an important limitation of the study; however, it is quite difficult to recruit healthy controls in older ages. Therefore, as suggested by de Jonghe (1997), we analyzed the groups separately in order to rule out a possible confounding effect of group membership. The IQCODE-T scores were not associated with age in any group. However, the MMSE scores of the patients with dementia were negatively correlated with age. In other words, the MMSE scores are affected by factors like age and education, whereas the IQCODE-T scores are not. These results, which were also emphasized in previous studies (de Jonghe, 1997; Jorm et al., 1991; Morales et al., 1995), further support the validity of the IQCODE-T in the screening of dementia.

In the present study, the IQCODE-T had the moderate test–retest reliability. However, internal consistency of the IQCODE-T was quite high (Cronbach's $\alpha = 0.95$). Previous studies reported higher test-retest reliabilities (Jorm et al., 1991; Jorm & Jacomb, 1989). Although the time interval was relatively brief, the effect of treatment, or the nature of illness, might not be controlled. Some of the informants may have ignored the instructions about a 10-year time frame and reported change from the first administration. Therefore, the 10-year time frame should be emphasized during the administration of the questionnaire. In addition, a relatively small proportion (nearly 27%) of the sample was admitted for the retest and this should be considered as a limitation.

Previous data suggest that the IQCODE scores are not influenced by length or type of the relationship (Fuh et al., 1995) or by the age and education of the informant (Jorm et al., 1996). However, the IQCODE have been shown to be associated with informant characteristics such as the mental health of the informant (like anxiety, depression, or burden) and the quality of the relationship between the informant and the patient (Jorm, 2004). For example, the IQCODE scores were negatively correlated with the data about how caring/controlling the participant was perceived to be (Jorm et al., 1996). Although only informants who are in close relationship with the patients and who reported no psychiatric/neurological disease were included, such characteristics of the informants were not examined as a factor in the current study. Therefore, future research should examine the effect of informant's/caregiver's burden on the IQCODE-T ratings.

In addition, the IQCODE-T may contribute to the diagnostic or prognostic evaluation of patients with mild cognitive disorder as suggested by Isella and colleagues (2006). However, patients with questionable dementia were excluded from the study sample for the accuracy of dementia diagnosis. Therefore, future studies need to investigate the discriminative the power of IQCODE-T in patients with mild cognitive impairment.

## Conclusion

Present study suggests that the IQCODE-T is a valid and reliable instrument that provides quantitative data about cognitive decline in older patients with dementia. It has advantages over the MMSE; it is widely applicable, not confounded by the age and the education of the patient; and it yields fewer false-positive results in older patients with depression. Therefore, the IQCODE-T can be used in clinical practice as an adjunct to other neurocognitive measures, especially in illiterate patients and in patients who cannot cooperate with detailed cognitive tests. However, before suggesting the IQCODE-T as a screening instrument for dementia, further research exploring the validity of the IQCODE-T in a community-based sample is needed.

## Conflict of Interest

There is no conflict of interest and we did not take any financial support for this research. The present study was approved by the ethics committee of Ankara University School of Medicine. All of the authors contributed equally to the design of the study. ETO-K collected data, carried out statistical analysis, and wrote the manuscript. EDT, EY, and BC collected data. BC and SU supervised the statistical analysis. The manuscript has been read and approved by all of the authors.

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