# Screening for mild cognitive impairment: usefulness of the 7-Minute Screen test

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***Detección de deterioro cognitivo leve en asistencia primaria. Utilidad del test de los Siete Minutos***

**Summary**

Introduction. *The «7- Minute Screen» is a neurocognitive screening test for the detection of Alzheimer's disease (AD) patients in primary care settings. It consists of 4 brief subtests (orientation, memory, visuoconstruction and verbal fluency) and provides a broader neuropsychological profile than other widely used screening tests,*
*The aim of the present study was to study the usefulness of this screening test for the detection of Mild Cognitive Impairment (MCI).*

Methods. *Thirty-two patients with probable AD (NINCDS-ADRDA criteria), 25 patients with MCI, and 35 healthy control subjects, matched for age and education, underwent a comprehensive neuropsychological battery and the Rio-de-la-Plata version of the 7-Minute Screen.*

Results. *This test showed 93% sensitivity and 97% specificity in detecting mild-moderate Alzheimer's disease MMSE < 24), but it exhibited a substantially decreased sensitivity (28%) in its ability to detect MCI in AD (MMSE > 24).*

Conclusion. *The screening batteries do not replace a more comprehensive neuro psychological assessment.*
*They are useful in detecting patients with mild dementia, but caution must be the rule when considering a diagnosis of MCI.*

***Key words:*** *7-Minute Screen. Screening. Dementia. Alzheimer's disease. Mild cognitive impairment.*

**Resumen**

Introducción. *El Test de los Siete Minutos fue desarrollado como un instrumento para emplearse en un consultorio de atención primaria para la detección de pacientes con enfermedad de Alzheimer. Los subtests que lo componen (orientación, memoria, visuoconstrucción y fluencia verbal) brindan un perfil neuropsicológico más amplio que el habitual en este tipo de baterías. El objetivo del presente estudio es evaluar su posible aplicación como instrumento de detección de deterioro cognitivo leve (DCL).*

Métodos. *Fueron estudiados 32 sujetos con enfermedad de Alzheimer probable (criterios de NINCDS-ADRDA), 25 sujetos con DCL y 35 sujetos control apareados por edad y años de educación. A cada uno se le administró una extensa batería neuropsicológica. Se utilizó la traducción y adaptación del protocolo original para su uso en nuestro medio.*

Resultados. *La sensibilidad del test fue del 93% y la especificidad del 97% para diagnóstico de enfermedad de Alzheimer leve-moderada (MMSE < 24). La sensibilidad del test desciende al 80% en la enfermedad de Alzheimer leve (MMSE > 24) y a sólo el 28% en DCL.*

Conclusión. *Las baterías de detección no reemplazan a las de diagnóstico, pero son de utilidad para sospechar la presencia de una demencia e iniciar el estudio sistematizado del paciente de riesgo, aunque en el caso de DCL se debe dar mayor importancia a los tests de memoria.*

***Palabras clave:*** *Test de los Siete Minutos. Detección. Demencia. Enfermedad de Alzheimer. Deterioro cognitivo leve.*

## INTRODUCTION

The prevalence of dementia in developed countries (USA) ranges from 1.5% in the 65 to 69 year old population to 20.5% among 85-89 years old individuals[1,2]. Alzheimer's disease (AD) represents the principal cause of dementia in Western countries[3-5]. Although there is no biological continuity between normal aging and AD, that does not seem to be the case from the cognitive clinical-symptomatic point of view. The concept of «mild cognitive impairment» (MCI)[6-10] was proposed as a research tool for the early diagnosis of AD, aiming at those individuals with mild cognitive disorders which, by themselves, cannot be classified as a dementia syndrome.

The criteria for «mild cognitive impairment» are:

- Complaint of memory loss corroborated by an informer.
- Memory impairment (below 1.5 SD) matched for age and educational level.
- Normality in daily life activities.
- Absence of dementia.

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These patients represent an at-risk population, since as many as 12% per year would progress from a «mild cognitive impairment» to an Alzheimer type dementia, as compared to 1-2% per year for the incidence of dementia in the general population[7-10].

Several studies show that primary health care physicians do not routinely consider the diagnosis of AD in the setting of their every day practice[11]. The same applies to MCI. Gifford and Cummings found that 75% of patients with moderate to severe dementia as well as 97% of those presenting with mild forms fail to be diagnosed by general practitioners[11]. This may be explained, at least in part, by the difficulty and complexity inherent in the assessment of cognitive functions with traditional methods. General physicians do not commonly use tests that examine mental state or, when they do so, they use tests having very limited sensitivity[11]. The Seven-Minute Screen was developed as an instrument to be used in primary-care practice for the detection of early AD[12].

The objective of the present study is to assess the applicability of this test in the detection of MCI and mild forms of Alzheimer's disease in primary health care settings.

## MATERIAL AND METHODS

Thirty-two patients diagnosed as probable AD according to the NINCDS-ADRDA criteria[13,25], 25 subjects with MCI and 35 controls, paired for age and education, were assessed.

The control group consisted of patients' family members and caregivers, unimpaired in their daily life activities, without a history of mental, neurological, or psychiatric diseases known to affect cognitive functioning, and free from psychotropic medication.

All individuals we re subjected to the Mini Mental State Exam (MMSE)[14], the Clinical Dementia Rating (CDR) scale[15] and a comprehensive neuro psychological battery for the assessment of memory function, language, praxis, attention, pro blem solving, visuospatial skills, judgement, behavior, and social functioning.

The 7-Minute Screen translation and adaptation to the Rio de la Plata setting (Drake et al, 2001), was used[16]. This test consists of four subtests that assess four areas that are typically involved in early stages of AD: temporal-spatial orientation, memory, verbal fluency and visuoconstructive skills. The Benton[17] orientation test, which assesses year, month, date, day and hour, assigning different scores according to the degree of error, was preferred to the one depicted in the MMSE, which gives 1 point for each correct reponse. The Benton orientation test gives 5 points for each month away from the current one (maximum score: 30); 1 point for each day away from the actual date (maximum score: 15); 10 points for each year off the present one (maximum score: 60); 1 point for each day of the week off the right one (maximum score: 3); and 1 point for every half hour off (the patient is asked what time it is, and a margin of 30 minutes from real time is accepted as correct: maximum score 5). The total score in the orientation sub-test corresponds to the sum of the five items evaluated. The higher the score, the worse the performance (0-113). If the patient does not make any mistakes, the score is 0. This allows for a better assessment of temporal orientation and a more accurate scoring of the degree of impairment, for it is not the same to misdate one day as it is to misdate one year.

The memory sub-test is an adaptation of Buschke's selective reminding test[18] , in which 16 drawings are shown to the subject, depicted in 4 cards comprising 4 different semantic categories each. The subject is asked to name each drawing as he/she is given the corresponding semantic categor y. Then the subject is given a distracting task (naming the months of the year backwards), and long term memory is evaluated asking the subject to recall the previously presented items. Following this task, the subject is given a semantic cue for those items that were not spontaneously recalled.

The final score corresponds to the total number of items remembered (both free and cued recall) with a maximum score of 16. In this case, a lower score represents a worse performance.

Visuoconstructive skills are assessed with the Freedman et al. adaptation of the Clock-drawing test[19], which has proved to be highly sensitive in diagnosing AD[20]. The subject is asked to draw a large circle, then, to place the numbers corresponding to the hours as found on a clock's face. After that, the subject is asked to draw the hands at «twenty to four». The maximum score is 7. One point is assigned for each one of the following conditions: *a)* if all the numbers, from 1 to 12 are present, written with the same notation method (arabic or roman) and there are no extra numbers added; *b)* if the numbers are in the correct sequence; *c)* if they are in the right quadrants; *d)* if the two hands are present; *e)* if 4 is pointed out in some way (it may be highlighted with a circle or any recognizable mark); *f)* if 8 is pointed out in any way (the same applies here for the method adopted), and *g)* if the two hands are drawn keeping the right proportions (the patient must know that the hand showing the hour is smaller than the one showing the minutes). A lower score indicates a worse performance (0-7).

Verbal fluency is evaluated requiring the patient to generate a list of words (animals) and one point is given for each animal named in one minute (repetitions are not to be scored). This test has shown to be sensitive not only to the detection of AD but also to other, non-AD dementias, since it assesses semantic storage and recall as well as executive functions (namely search strategies 21). The lower the score, the worse the performance (0-30).

## STATISTICAL ANALYSIS

The non-parametric statistical analysis of variance (ANOVA, Kruskal-Wallis) and the Spearman correlation

**TABLE 1. Demographic data**

| | *Controls* | *MCI* | *ATD* | |
|---|---|---|---|---|
| Age | 69.2 (7) | 71.5 (7) | 70.6 (5,2) | ns $p = 0.24$ (F: 1.42 [3.09]) |
| Schooling | 9.8 (3.8) | 9.7 (3) | 8.4 (2,9) | ns $p = 0.18$ (F: 1.69 [3.09]) |
| n | 35 | 25 | 32 | |

MIC: mild cognitive impairment; ATD: Alzheimer's type dementia.

coefficient were used to analyze the data. The sensitivity and specificity of this battery in the detection of mild cognitive impairment and Alzheimer's type dementia were evaluated. Statistical significancy was established from a value of $p < 0.05$ in all the cases. Data were processed with the BMDP-PC90 statistical program[22].

## RESULTS

The demographic data of the populations can be seen in table 1.

The populations were paired by age and education. Significant differences were seen when comparing performance between controls and AD patients, ($p < 0.0001$), between AD patients and MCI ($p < 0.001$), but not between MCI and controls ($p = 0.2$), for performance in the MMSE, as shown in table 2.

The scores of the four sub-tests of the Seven-Minute Screen showed significant diffe rences between controls and AD, and between MCI and AD. We found significant differences in Buschke's free recall ($p < 0.001$) and in verbal fluency ($p < 0.001$) between controls and MCI, but not in Orientation ($p = 0.15$), in cued recall ($p = 0.3$), and in the Clock-drawing test ($p = 0.6$) (table 3) .

Using the same multiple regression analysis method Solomon used in his study[12], the 7-Minute Screen has a 78% sensitivity and a 97% specificity to detect patients with mild AD (mean MMSE 22.8 + 3.7). When compared to the MMSE, for those AD patiens with scoring below 24, the 7-Minute Screen has a 93% sensitivity and 97% specificity.

In AD patients with a MMSE score above 24, the sensitivity of the Seven-Minute Screen is 80%, and falls to 28% for MCI (table 4).

**TABLE 2. Results of MMSE**

| | *Controls* | *MCI* | *ATD* | |
|---|---|---|---|---|
| MMSE (total score) | 28 (2.2) | 27.4 (1.4) | 22.8 (3.7) | Controls vs DTA; $p < 0.0001$<br>Controls vs DCL; $p$ = ns<br>DCL vs DTA; $p < 0.001$ |

**TABLE 3. Results of the Seven Minute T est**

| | *Controls* | *MCI* | *ATD* | |
|---|---|---|---|---|
| Orientation | 0.8 (1.9) | 1.8 (3.5) | 15.1 (20.3) | Controls vs DTA; $p < 0,001$<br>Controls vs DCL; $p$ = ns<br>MCI vs DTA; $p < 0,002$ |
| Free recall | 9.1 (2.5) | 6.3 (2.2) | 3.6 (2.3) | Controls vs DTA; $p < 0,001$<br>Controls vs DCL; $p = 0,001$<br>MCI vs DTA; $p < 0,0007$ |
| Recall with cues | 15.3 (1.1) | 14.4 (2.2) | 10.1 (4) | Controls vs DTA; $p < 0,001$<br>Controls vs DCL; $p$ = ns<br>MCI vs DTA; $p < 0,001$ |
| Clock test | 6 (1.6) | 5.8 (1.1) | 4 (2.6) | Controls vs DTA; $p < 0,001$<br>Controls vs DCL; $p$ = ns<br>MCI vs DTA; $p < 0,01$ |
| Verbal fluency | 18.5 (4.7) | 14.4 (1.1) | 11.1 (5.2) | Controls vs DTA; $p < 0,001$<br>Controls vs DCL; $p = 0,001$<br>MCI vs DTA; $p < 0,01$ |

## DISCUSSION

The aim of developing mini-batteries such as the 7-Minute Screen is the early detection of cognitive impairment at the General Practitioner's office, for it is in this setting where time becomes a limiting factor for more comprehensive instruments. The 7-Minute Screen takes only a short time, it does not require previous training in neuropsychology and allows a quick cognitive assessment for Alzheimer's Disease through sub-tests such as learning and delayed recall of a list of words, orientation, clock-drawing, and verbal fluency[23-24].

Although the four subtests included in the test have proved useful for the detection of AD, that is not the case for MCI, since the only ones that showed statistical significance when compared with normal controls were the free recall, and the verbal fluency sub-tests.

This is not unexpected if we consider that, by definition, MCI is an isolated memory impairment.

This is in agreement with the results of Grober et al.[25] who found that free recall measured with the Buschke memory test has a high predictive power to diagnose dementia. Regarding verbal fluency, Ritchie et al.[26], found the same differences in a study performed to validate the construct of MCI.

In our sample, we found a 93% sensitivity and 97 % specificity for the diagnosis of mild-moderate Alzheimer's disease (MMSE < 24). Our data match with those of Solomon et al.[12], who report a 92% sensitivity and 96 %

**TABLE 4. Detection of Alzheimer type dementia (ATD) and mild cognitive impairment (MCI)**

| | *Sensitivity (%)* | *Specificity (%)* |
|---|---|---|
| ATD with MMSE < 24 | 93 | 97 |
| ATD with MMSE > 24 | 80 | 97 |
| MCI | 28 | 97 |

specificity. However, when an attempt is made to detect mild forms of Alzheimer type dementia, the sensitivity decreases to 80 % and when MCI is considered, it falls to 28 %. This has already been described for other short tests such as the MMSE by Petersen et al.[10].

Thus our data show that short tests such as the MMSE or the 7-Minute Screen are not useful to detect MCI in primary health care settings. Nevertheless, the General Practitioner can still use these instruments just for memory assessment purposes when screening for MCI, given that they should then administer a more comprehensive neuropsychological battery for an accurate approach to this at-risk population.

The limitations of these instruments for the detection of MCI must be known by those who use them in their daily practice: Due to their low sensitivity, they may lead to faulty conclusions and subjects undergoing a MCI could be misdiagnosed as «normal», precluding a more comprehensive assessment.

If we consider that a high percentage of patients with MCI are at risk of progressing to AD, and that the currently available medications have proved to be most efficacious in the earlier stages of the disease, a misleading diagnosis would deprive an important number of patients of the potential benefits of an early treatment.

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