

Comparison of MMSE, MoCA and GPCog in the early diagnosis of dementia



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Background The epidemic increase of dementia challenges the detection of dementia in its prodromal stages (Mild Cognitive Impairment–MCI) (1). One action strongly promoted from scientific societies is the detection of dementia in its prodromal stages defined as Mild Cognitive Impairment (MCI) (2) and recently codified as “mild neurocognitive disorders” in DSM 5 (3). From decades, MMSE is the basic cross-cultural tool for assessing dementia (4). In the years, the widespread and worldwide administration of MMSE has pointed out some limitations (5) as a low sensitivity in MCI especially in patients with high cognitive reserve (6) and/or education (7). Recently, MoCA was introduced specifically to assess MCI (www.mocatest.org) (8). GPCog is a brief tool designed for primary care (9) (www.gpcog.com.au) whose cognitive section has a 5-item subtest for assessing memory similar to MoCA. The aim of this study is to evaluate the performance of these 3 tests in detecting MCI.

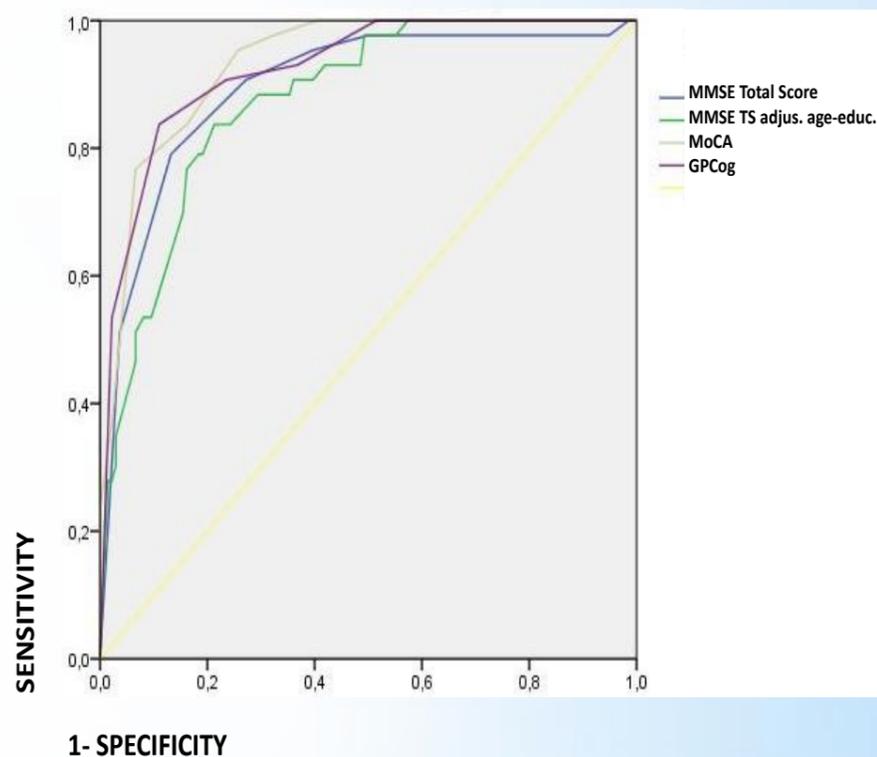
Methods The sample consisted of subjects (Ss) referring to a memory clinic for cognitive impairment and a control group without cognitive impairment. Exclusion criteria were: psychiatric disorders, CHF, COPD, diabetes, sensory impairments, lack of an informant. The Ss were evaluated with CIRS (Cumulative Illness Rating Scale), **MMSE** (normal: 30/30 [10]) accounted both as **Total Score (TS)** and **TS adjusted for age and education**, **MoCA** (normal: $\geq 26/30$), **GPCog** (normal: Patient section 9/9; Informant Section 6/6), **IADL** (normal : 8/8), **CDR** (Clinical Dementia Rating scale). To ameliorate sensitivity of MMSE, the spelling backward was not administered as recommended (5). All the Ss with cognitive impairment were examined with neuroimaging (CT or MRI). Characteristics of the whole sample were: 179 Ss, Females 51%; age $71,6 \pm 8,1$; education $7,9 \pm 4$.

Results According to CDR and DSM 5, the sample was classified in three subgroups: 1) **normal (CDR 0, 43 Ss)**; 2) **MCI (CDR 0.5, 110 Ss)**; 3) **Mild dementia (CDR 1, 26 Ss)**. Table 1 reports comparison of demographics, cognitive and functional test scores in the three subgroups.

Table 1	CDR 0	CDR 0,5	CDR 1	AnOVa (F)
Age	67,5 ± 8,7	72,3 ± 7,7	75,3 ± 6,4	9,315 < 0.001
Education	10,2 ± 4,4	7,1 ± 3,3	7,9 ± 4,7	10,635 < 0.001
CIRS	1,2 ± 0,9	1,9 ± 1,2	1,9 ± 0,9	3,280 < 0.05
MMSE TS	29,3 ± 1	26 ± 2,4	22,9 ± 2,3	73,930 < 0.001
MMSE TS adjusted for age-education	28,4 ± 1,5	25,5 ± 2,2	22,5 ± 1,9	67,102 < 0.001
MoCA	25,9 ± 2,1	20,5 ± 3,1	16,7 ± 2,8	90,733 < 0.001
GPCog - Cognitive Section	8,21 ± 1,1	5,1 ± 2,1	2,77 ± 1,6	76,442 < 0.001
IADL	7,9 ± 0,3	7,4 ± 1,1	5,8 ± 1,7	29,933 < 0.001

A ROC curve was applied to MMSE both scores, MoCA, GPCog (cognitive section) against DSM 5 dementia diagnosis. The ROC curves of MoCA, GPCog and MMSE – TS showed very similar slopes that are superior to MMSE TS adjusted for age and education. Table 2 reports Area Under the Curve (AUC). All the AUC values were significant: MoCA reported the best performance however GPCog and MMSE – TS, respectively, showed very slight differences.

Table 2	MMSE Total Score	MMSE TS adjusted age-educ.	MoCA	GPCog Cognitive Section
AUC	0,917	0,875	0,933	0,924
AUC 95% confidence interval	0,875-0,959	0,821 - 0,929	0,898-0,969	0,882–0,967
Significance	,000	,000	,000	,000



Conclusions MoCA and GPCog have similar performance in detecting MCI and appear superior to MMSE.

Nevertheless when MMSE is administered without spelling backward and with a score not adjusted for age and education, may detect MCI.

Psychometric tools with a 5-item subtest for assessing memory confirm to be more sensitive of MMSE in early diagnosis of dementia.

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