

BRIEF VERSION OF MINI-MENTAL STATE EXAMINATION

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The Mini-Mental State Examination (MMSE) is a multidimensional cognitive assessment which has some floor and ceiling effects. Some have proposed short versions of this test to overcome unwanted characteristics such as Differential Item Functioning (DIF).

Objectives - The purpose of this analysis was to obtain a unidimensional brief version of the MMSE based on modern psychometrical technique and propose cut-off points for this new version.

METHODS

Data was obtained from two public hospitals at Brasília-DF. Participants were 192 outpatients from the geriatric ambulatory and were evaluated with a cognitive battery that included the MMSE.

Table 1. Age and education of participants

Age (years)	Education				Total
	illiterate	elementary	basic	higher	
60 - 70	4	14	9	10	37
71 - 80	14	42	13	12	81
81 - 85	27	20	12	4	63
91 - 100	4	5	1	1	11
Total	49	81	35	27	192

Psychometrical analysis

Since the MMSE is not an unidimensional instrument, multidimensional two-parameter logistic (M2PL) of Item Response Theory (IRT) was used to obtain factor loadings, location and discrimination for the 30 items. The NOHARM software was used to obtain both factorial analysis and M2PL.

Table 2. Factor Loadings, Multidimensional Location and Discrimination for the 13 item MEEM

Item	Factor 1	Factor 2	Location	Discrimination
1. What is the year?	0,94	0,00	-0,1	2,8
2. What is the month?	0,77	-0,29	-0,3	1,5
3. What day of the month?	0,84	-0,31	0,1	2,0
4. What day of the week?	0,81	-0,32	-0,2	1,8
5. What time is it now?	0,78	-0,13	-1,2	1,3
6. Where are we now?	0,78	0,12	-0,1	1,3
7. What is the State?	0,75	-0,36	-1,0	1,5
8. Are we in a hospital, in a building, or in a house?	0,74	-0,19	-0,3	1,2
9. What is the place?	0,77	0,01	-0,8	1,2
10. What is the floor of the building?	0,72	-0,20	-0,6	1,1
What were those three words I asked you to remember?				
11. (mesa)	0,76	-0,33	-0,1	1,4
12. (relógio)	0,83	-0,22	0,2	1,7
13. (caneta)	0,79	-0,25	0,4	1,5

RESULTS

Thirteen of the 30 items were selected because they had higher factorial loading in Factor 1 (0.7 to 0.9), good location (-1.3 "easier" to 0.2 "harder") and discrimination (1.1 to 3). Indeed, registration, naming, repeating and three-command tasks had ceiling effect and low discrimination. Calculation task had floor effect. Reading, writing and drawing tasks depends on education and showed poor discrimination. Table 2 shows the items of the brief version of MMSE.

Table 3. Clinical and control group characteristics

Age (years)	Control group		Clinical group		Total
	literate	illiterate	literate	illiterate	
60 - 70	13	0	10	3	26
71 - 80	18	6	35	7	66
81 - 90	9	4	23	17	53
91 - 100	4	0	1	3	8
Total	44	10	69	30	153

For the study of the cut-off scores for the 13 item MMSE, the sample was classified according to the CDR. Patients with CDR 0 or 0.5 (Control Group) were compared to mild to moderate dementia patients (CDR 1 or 2). Depression was screened with the GDS scale. Age was not associated with overall performance, but there was a difference between illiterates (median = 8) and educated (median = 12) performance, $U = 232.5$; $p < 0.001$, $r = -0.37$. Areas under the ROC curve for the short version (illiterate = 0.77, 0.62-0.92 and educated = 0.73, 0.63-0.82) were similar to the areas obtained for the original test (0.77, 0.63-0.90 and 0.71, 0.61-0.81).

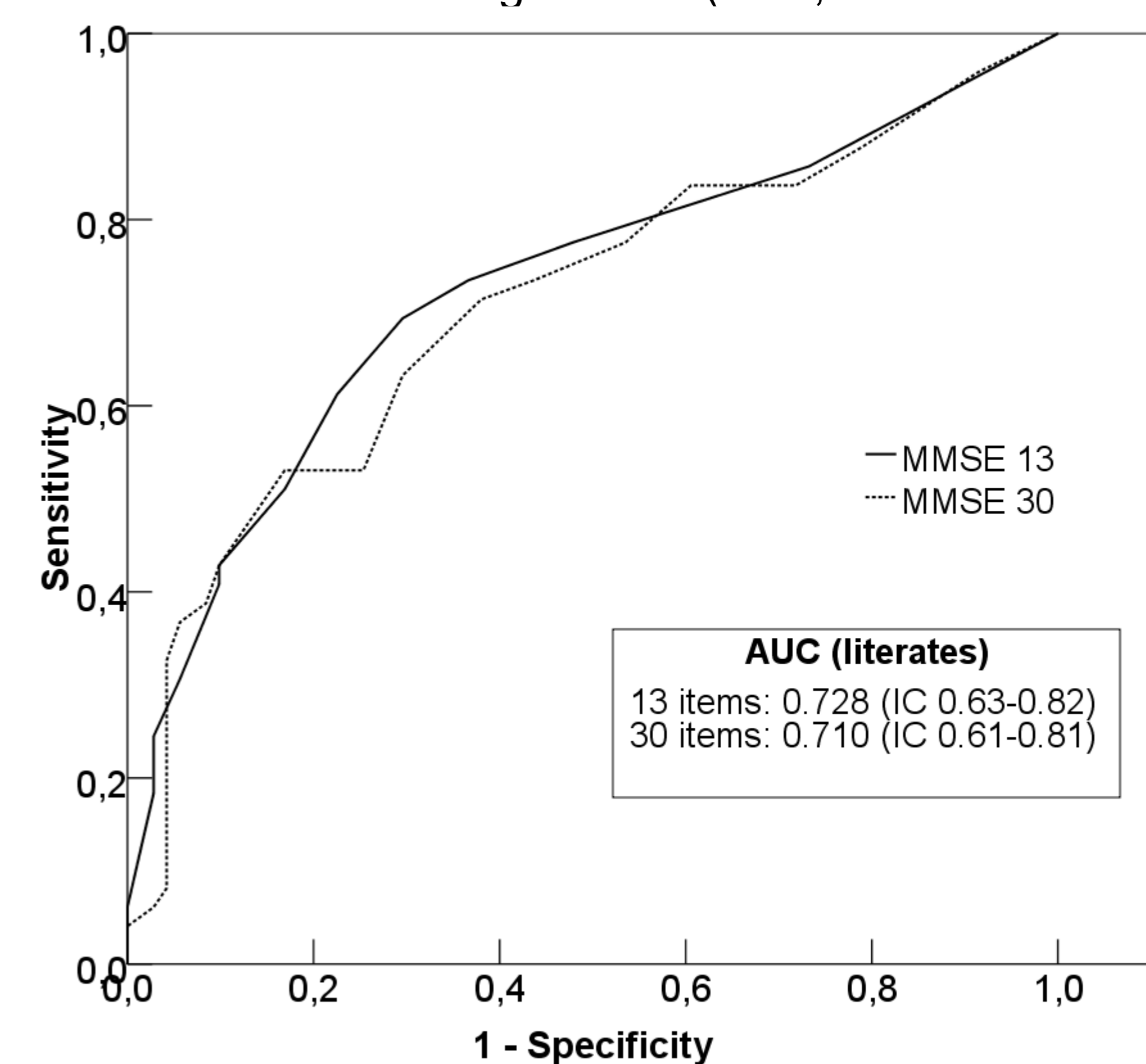


Figure 1. ROC curve for the original and brief MMSE for the literate group.

For the illiterate group, a score below 7 provided a sensitivity of 82% and specificity of 50%. For the educated group, a score below 10 provided sensitivity of 73% and specificity of 54%. To test the applicability of the cut-off scores, an independent sample consisting of 25 outpatients with Cognitive Decline to Moderate Dementia (CDR 0.5 to 2) and similar characteristics of the larger sample was evaluated. The 13 item version correctly identified 23 out of 25 patients.

Conclusion

In conclusion, we have demonstrated that a brief 13 items version of MMSE is good enough to replace the 30 items for screening purposes. This 13 items version is unidimensional, fits well in IRT with very discriminative items and area under the ROC curve was similar when compared with the original test. Indeed, no floor and ceiling effects were observed.