

VALIDATION OF A 6 ITEM COGNITIVE IMPAIRMENT TEST WITH A VIEW TO PRIMARY CARE USAGE

PATRICK BROOKE¹* AND ROGER BULLOCK

¹General Practitioner, Newbury; Research Clinical Assistant, Kingshill Research Centre, Victoria Hospital, Swindon, UK

²Director, Kingshill Research Centre, & Consultant in Old Age Psychiatry, Victoria Hospital, Swindon, UK

ABSTRACT

Objective. To validate the 6 Item Cognitive Impairment Test (6CIT) against the Mini-Mental State Exam (MMSE) with a view to usage as a screening tool.

Design. Three groups with varying levels of dementia were tested using the MMSE, 6CIT and Global Deterioration Scale (GDS).

Setting. Testing was carried out within Wiltshire, both in the community and outpatients.

Subjects. Patients were selected from a hospital database of dementia patients and were stratified into two groups according to GDS; a control group was also tested.

Results. Two hundred and eighty-seven patients were tested: 135 controls (GDS 1–2), 70 with mild dementia (GDS 3–5) and 82 with more severe dementia (GDS 6–7). The 6CIT and MMSE were found to correlate well, $r^2 = -0.911$ ($p < 0.01$), when all groups were analysed. Correlation falls to $r^2 = -0.754$ ($p < 0.01$) in the mild dementia group. In the GDS 3–5 group, the MMSE has a sensitivity and specificity of 51.43% and 100% respectively (cutoff 23/24). The 6CIT gives a sensitivity and specificity of 78.57% and 100% (cutoff 7/8).

Conclusion. The 6CIT is a brief and simple test of cognition, which correlates well with the MMSE but outperforms it in milder dementia. The MMSE is of little value as a screening test for dementia. Copyright © 1999 John Wiley & Sons, Ltd.

KEY WORDS—6 Item Cognitive Impairment Test; 6 Item Orientation–Memory–Concentration Test; Mini-Mental State Examination; Global Deterioration Scale; dementia; screening; sensitivity; specificity; correlation

The average consultation in UK primary care lasts 7.5 minutes. Thus for many members of the primary health care team, cognitive testing is too time-consuming to be done on a regular basis. The MMSE (Folstein *et al.*, 1975), although time-consuming, is often regarded as the ‘gold standard’ cognitive test. Other abbreviated tests exist, eg the 10-item Mental Test Score (Hodkinson, 1972). However, we wished to find as brief a test as possible.

The 6CIT (Katzman *et al.*, 1983), also known as the 6 Item or Short Orientation–Memory–Concentration Test (60MCT or SOMCT) and as the Short Blessed Test (SBT), is an abbreviation of the 26-Item Blessed Information–Memory–

Concentration Scale (BIMC) developed by Blessed *et al.* (1968). When compared, they have been shown to be equally able to discern presence and severity of dementia (Davis *et al.*, 1990). The BIMC scale has also been shown to correlate highly with the MMSE (Villardita and Lomeo, 1992). The 6CIT has been shown to be equivalent to the MMSE in identifying dementia in one French trial (Davous *et al.*, 1987).

As a centre, we are keen to establish the suitability of the 6CIT as a screening tool for dementia. Prior to using it in primary care we were aware of the need to revalidate the test in a UK setting, as well as to establish the correct cutoff scores to indicate the possible presence of dementia and the need for further investigation.

The 6CIT has recently been included as the cognitive impairment test for the Easy Care Elderly Assessment System—a European project which

*Correspondence to: P. N. R. Brooke, The Surgery, 10 St Johns Rd, Newbury, Berkshire RG14 7LX, UK. Tel: 01635 40160. Fax: 01635 582497.

	Maximum error	score	×	Weight	=	Weighted score
1. What year is it now?	1	.....	×	4	=	.....
2. What month is it now?	1	.....	×	3	=	.....
<i>Memory Phrase - repeat after me:</i>						
<i>John|Brown,|42|West Street,|Bedford</i>						
3. About what time is it (within 1 hr)?	1	.....	×	3	=	.....
4. Count backwards 20 to 1?	2	.....	×	2	=	.....
5. Say months in reverse order?	2	.....	×	2	=	.....
6. Repeat the memory phrase?	5	.....	×	2	=	.....
(Score 1 for each incorrect response)						Total =

Fig. 1. The 6CIT test

aims 'to create a European standard for assessing the quality of life of older people' (Philp, 1997).

METHOD

We administered the 6CIT, MMSE and GDS (Reisberg *et al.*, 1982) to three groups of people. The first group of 135 people were members of a control group used by our centre who had responded to advertisements in the local press requesting help into dementia research. This group had been neuropsychologically tested approximately 1 year previously and all patients with or suspected of having dementia had been excluded. The control group were tested on the 6CIT and MMSE as a part of further neuropsychological testing (group 1). (See Fig. 1 for the 6CIT test.)

The second and third groups of patients were known to the Department of Old Age Psychiatry in Swindon and had received a diagnosis of dementia. They were taken from a computer database of patients (non-randomized selection). Seventy patients were categorized as having a GDS score of 3-5 (group 2) and 82 patients a GDS of 6 or more (group 3). The majority of group 2 were tested in an outpatient memory clinic, whereas most group 3 patients were tested in the community, largely in residential or nursing homes.

RESULTS

A summary of results is given in Table 1. Analysis of size of effect produces an eta² of 0.867, giving the study a power of >90%.

In order to match the groups more closely, the control group is randomly reduced to *n* = 75 for analysis of subgroups of dementia, while the full control group *n* = 135 is used when analysing

Table 1. Summary of results

	Group 1 (control)	Group 2 (GDS 3-5)	Group 3 (GDS > 5)
<i>Sex</i>			
Male	51	31	12
Female	84	39	70
<i>Age</i>			
Mean	68.1	73.8	81.7
Range	-33	-42	-30
SD	7.6	9.4	6.4
<i>MMSE</i>			
Mean	28.47	22.1	10.23
Range	-6	-22	-22
SD	1.42	5.27	6.17
<i>6CIT</i>			
Mean	1.46	13.61	23.5
Range	-7	-28	-19
SD	1.91	7.17	4.7

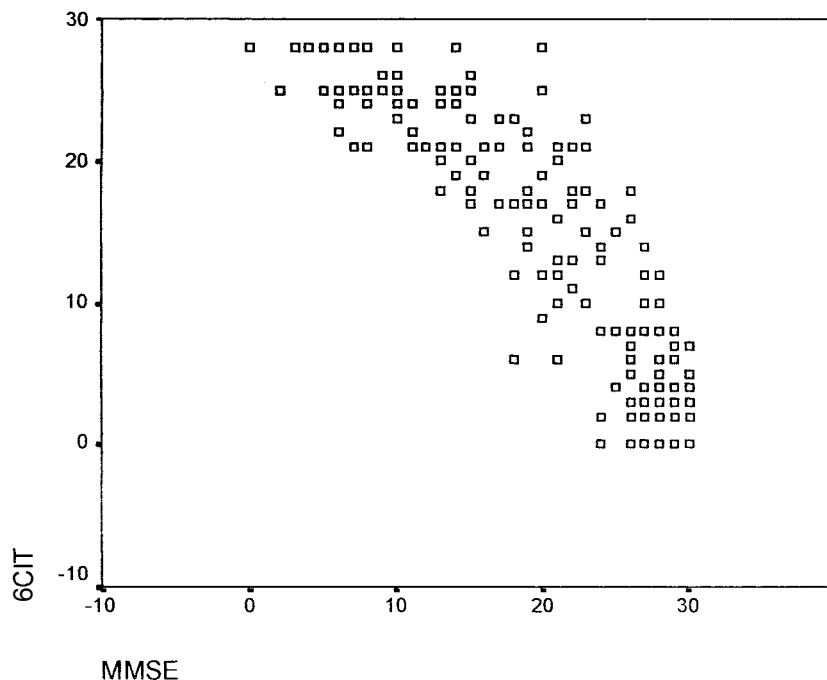


Fig. 2. Scattergram MMSE vs 6CIT scores

Table 2. MMSE results

Cutoff	All dementia		Dementia GDS 3-5	
	Sensitivity	Specificity	Sensitivity	Specificity
20/21	64.5%	100.0%	31.4%	100.0%
21/22	70.4%	100.0%	41.4%	100.0%
22/23	74.3%	100.0%	44.3%	100.0%
23/24	78.6%	100.0%	51.4%	100.0%
24/25	82.0%	98.5%	58.6%	100.0%
25/26	84.0%	97.7%	64.3%	100.0%
26/27	86.8%	90.3%	72.9%	93.3%
27/28	92.8%	75.6%	84.3%	74.7%
28/29	97.4%	55.6%	94.3%	53.3%
29/30	98.7%	29.6%	97.1%	26.7%

combined dementia groups. Overall comparison of the 6CIT with the MMSE produced a Spearman's correlation coefficient $r^2 = -0.911$ ($p < 0.01$). (See Fig. 2.)

Analysis of group 2 patients (milder dementia) produces a reduced correlation of $r^2 = -0.754$ ($p < 0.01$) when comparing the 6CIT with the MMSE. The GDS 3-5 group's lower correlation can be seen to be due to the lower sensitivity and specificity of the MMSE. (See Tables 2 and 3.)

The 6CIT at a cutoff of 7/8 produced a sensitivity and specificity (in GDS 3-5 group) of 78.57% and

Table 3. 6CIT results

Cutoff	All dementia		Dementia GDS 3-5	
	Sensitivity	Specificity	Sensitivity	Specificity
12/13	76.3%	100.0%	52.9%	100.0%
11/12	80.3%	100.0%	61.4%	100.0%
10/11	81.6%	100.0%	61.4%	100.0%
9/10	84.9%	100.0%	68.6%	100.0%
8/9	85.5%	100.0%	68.6%	100.0%
7/8	90.1%	100.0%	78.6%	100.0%
6/7	90.1%	97.0%	78.6%	98.7%
5/6	92.1%	95.6%	82.9%	97.3%

100% respectively. Positive predictive value would be 100% and negative predictive value 83.33%.

The MMSE at a conventional cutoff of 23/24 only produces a sensitivity and specificity of 51.43% and 100%, or at a higher cutoff of 25/26, 64.29% and 100%. Receiver operating curve characteristics display the increased performance of the 6CIT over the MMSE well (see Fig. 3).

CONCLUSIONS

The 6CIT, although being considerably shorter than the MMSE, correlates well with the MMSE

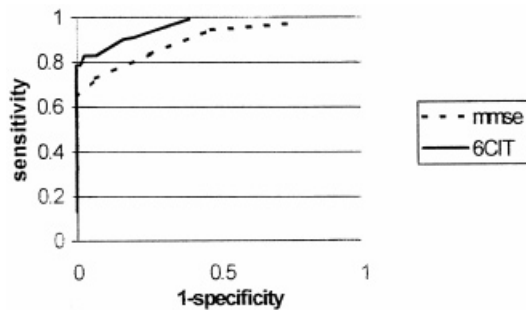


Fig. 3. Receiver operating characteristics curves for MMSE and 6CIT in the GDS 3–5 group

and is thus a valid measure of cognitive impairment. The 6CIT is especially useful in the identification of milder dementia; although its sensitivity is only approximately 80%, this is considerably better than that of the MMSE, whose sensitivity ranges from 50 to 65%, depending on cutoff.

These findings confirm that the MMSE would be a very poor screening test for dementia in primary care (Galasko *et al.*, 1990), due both to length of time taken for administration and poor sensitivity and specificity. Wind *et al.* (1997) confirm these findings. Our results for the MMSE (overall figures) are similar to other published data: Kukull *et al.* (1994) obtained a sensitivity and specificity of 63% and 96% respectively with a cutoff of 23/24; O'Conner *et al.* (1989) obtained results of 55% and 92% at the 23/24 cutoff; Galasko *et al.* (1990) when screening for early Alzheimer's disease with the MMSE only achieved a sensitivity of 32.4% at the 23/24 cutoff.

The 6CIT in comparison to the MMSE is a faster, simpler test of cognition with better sensitivity and specificity; this is most marked in the milder dementia group.

The need for earlier diagnosis in dementia is growing ever stronger as we learn the importance of establishing a specific diagnosis of dementia type, in order to delay progression or onset of symptoms. The 6CIT is to form the cognitive screening section of Easy Care (a pan-European elderly assessment tool); it correlates well with the MMSE at $r^2 = -0.925$ ($p < 0.01$). The 6CIT should prove itself to be a better screening tool than the MMSE not only due to its brevity and statistical validity, but also to its lack of interpretative error (eg interpretation of design copying or writing a sentence) and its simple translatability into other languages.

We intend to install the 6CIT in 11 local primary care surgeries that use EMIS computer software.

- The 6CIT is a brief and simple test of cognition
- The 6CIT correlates highly ($r^2 = 0.911$, $p < 0.01$) with the MMSE
- The 6CIT is more sensitive than the MMSE in detecting mild dementia
- The 6CIT is thus a useful tool for cognitive screening in primary care

The computer will prompt the user to perform the 6CIT when certain diagnoses are entered, or as part of routine health screening. Weighting of the scores will be done automatically by the computer, which will also interpret the results and advise as to whether the patient needs further investigation or referral. Review of these patients with long-term follow-up will then be possible to further evaluate the role of screening and the 6CIT.

ACKNOWLEDGEMENTS

The authors would like to thank Sarah Voss, Dr Eric Connor, Clair Groark, Kate Passfield and Jonathan Elcock for their assistance, as well as the patients, carers and volunteers who took part.

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