Memory Deficits in Mild Cognitive Impairment are Identified with *COGTEST*

Roger Bullock[1], Linda Berkowitz[2], Geetika Nath[2], Susan DeSanti[3]

Kingshill Research Centre, Victoria Hospital, Swindon, United Kingdom[1]; The Cognition Group, Newark, DE, USA[2]; NYU School of Medicine, New York, NY, USA[3]

Abstract:

Background:
Understanding the memory impairment associated with mild cognitive impairment (MCI) and identifying assessment tools capable of measuring these impairments continues to be of paramount importance. The goal of this study was to examine the utility of Cogtest, a computerized neuropsychological test battery used with a variety of clinical populations and in clinical trials, to identify memory deficits in MCI.

Methods:
Cogtest (www.cogtest.com) has a library of computerized cognitive assessments with a platform allowing for accurate recording of reaction times and enhanced standardization of administration relative to conventional paper-pencil tests The Word List Memory Test (verbal selective reminding memory test), Face Memory Test (visual memory), and the Auditory Number Sequencing Test (working memory) were administered to MCI (n=44) and healthy controls (HC, n=50). All subjects received a screening battery which included a paired associate test. A z score = -1.5 SD below that of a normative group on this test was used as the objective measure of memory impairment in the definition of MCI.

Results:
Group differences were found for education and this was covaried in all analyses of Cogtest variables. ANCOVA were used to examine Cogtest variables and significance levels were set to p< .01. Significant Group performance differences were seen on the Word List Memory Test (a computerized version of the Buschke selective reminding test). MCI subjects remembered significantly fewer words on the first trial (mean = 4.8), on all trials (mean = 36.3), and after a 30 minute delay (mean = 5.8) compared to HC (mean's = 9.2, 54.3, 12.8, respectively). In the Face Memory Test, MCI subjects remembered significantly fewer words compared to HC (62% verses 78%, p<.001. After a 30 minute delay, MCI subjects remembered significantly fewer faces (63%) compared to HC (73%) but not from each other. In the Auditory Number Sequencing task, MCI subjects sequenced significantly fewer numbers (mean = 9.9) compared to HC (mean = 12.2).

Conclusions:
We conclude that multiple memory domains as assessed with Cogtest are affected in MCI. The Cogtest library of tests is able to identify cognitive deficits in MCI patients.

Introduction

Mild cognitive impairment (MCI)[1] is a term indicating a transitional stage between normal ageing and dementia [2]. Clinically, it refers to an impairment in one or more cognitive domains, usually memory, in subjects with adequate general functioning who do not fulfill the diagnostic criteria for dementia [2]. Understanding the memory impairments associated with MCI and identifying cognitive assessment tools capable of measuring them, continues to be of paramount importance. Computerized batteries are being more commonly employed for this purpose.

Aim

To examine the utility of *COGTEST* in identifying memory problems in MCI and to determine if MCI is domain specific or a generalized memory performance deficit exists.

Method

MCI was classified using a screening battery. Performance $\leq$ -1.5 SD below a normative group on a paired associate learning test was the operational definition of MCI. All patients signed an approved IRB consent form.

	MCI Grp	Cnt Grp
AGE	67 years	64 years
EDUCATION	11 years*	13 years
% ♀	55%	74%
% WHITE	97%	100%

p < .05

Cognitive Assessment

Auditory Number Sequencing (attention, working memory, executive functions): Subjects hear a series of numbers (e.g. "9.. 3.. 6"; minimum=2 digits, maximum=8 digits) and are asked to repeat the numbers in order, from lowest to highest, requiring both working memory maintenance and manipulation.

Word List Memory (verbal memory): The WLM is an auditory-verbal recall test using a selective reminding paradigm. Subjects are asked to recall as many as possible of 16 words that have been auditorily presented by the computer. On the second trial, the computer repeats only those words that subjects have not recalled and subjects are then asked to try to recall all 16 words again. The process is repeated up to five times total and there is a delay trial after 30 minutes.

Face Memory Test (visual memory): Subjects see a series of 40 computer-generated faces (3 sec. exposure each), and have to recognize the face seen previously in 40 forced choice trials. After 30 minutes the delay phase of the test is administered.

Statistical Analysis:

Performance on the 3 cognitive tests were examined using an ANCOVA with education as the covariate and post hoc Tukey HSD tests. Statistical significance was declared at the .01 level (two-tailed).

Results

Face Memory Test: MCI group remembered significant fewer faces than controls on immediate and delayed trials.

Percent Correct Immediate — p < .001

Percent Correct Delay — p < .001
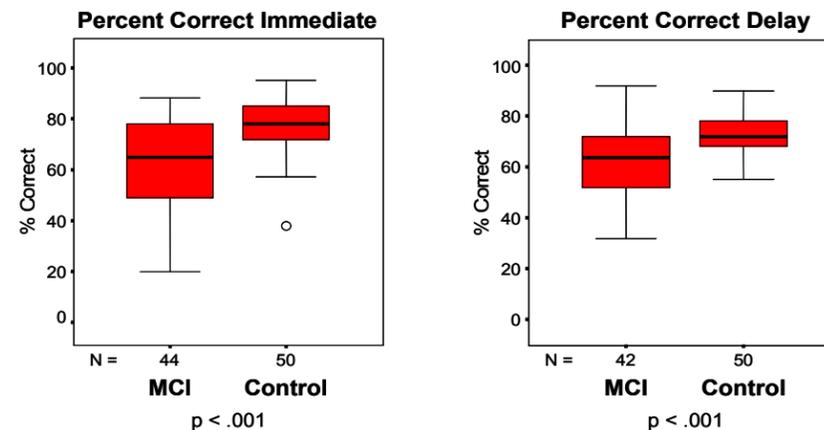
Auditory Number Sequencing Test: MCI group sequenced significantly fewer numbers (mean = 9.9) compared to the control group (mean = 12.2).


Total Correct
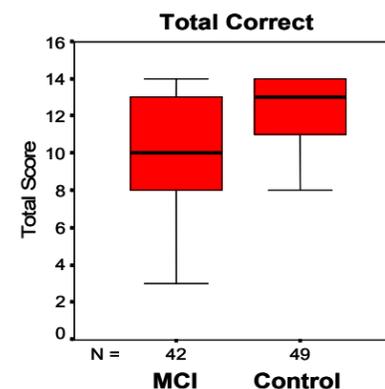
Word List Memory Test: MCI group remembered significantly fewer words than the control group on the first trial, on all trials and after a 30 minute delay. Further, the MCI group remembered fewer items from trial to trial (p's < .001).

Total Learning Over 5 Trials — p < .001

Delayed Recall Correct — p < .001
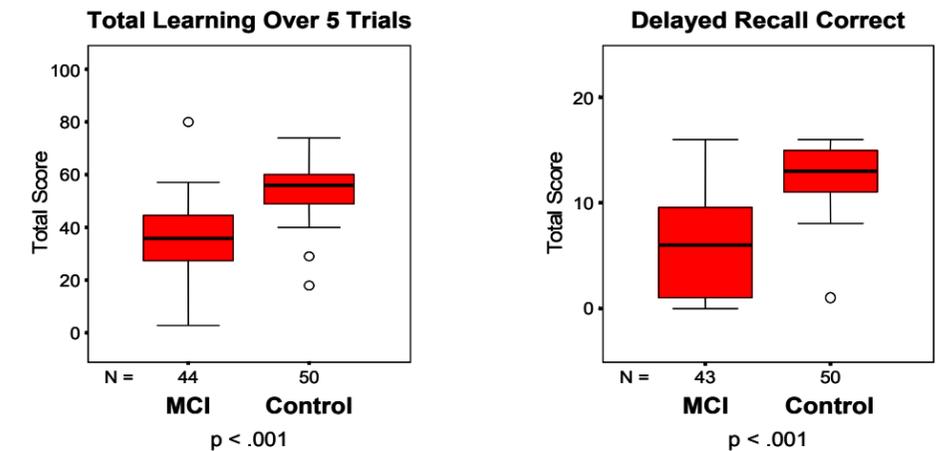
Classification accuracies were examined using a discriminate function analysis. Using all variables, we accurately classified 81% of the MCI group and 92% of the control group.

Classification Accuracy (using all cognitive measures)
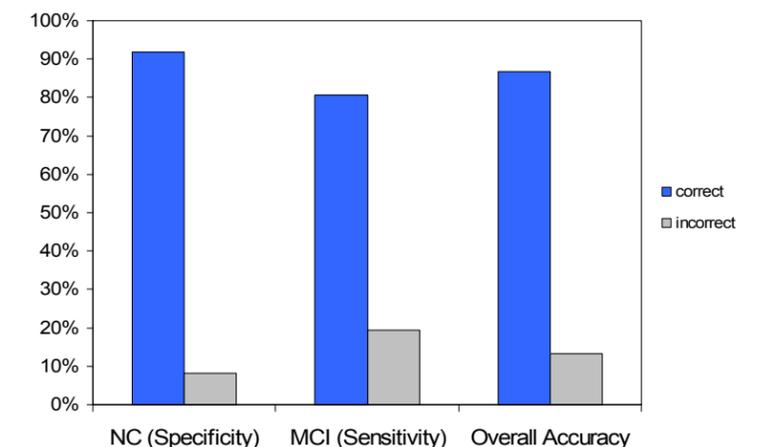
Conclusion

Multiple memory domains are affected in MCI and *COGTEST* has a library of cognitive tests that are sensitive at identifying cognitive deficits in these individuals.

References

[1]. Flicker C, Ferris SH, Reisberg B: Mild cognitive impairment in the elderly: predictors of dementia. Neurology 1991; 41:1006–1009
[2]. Petersen RC, Smith GE, Waring SC, et al: Mild cognitive impairment: clinical characterization and outcome. Arch Neurol 1999; 56:303–308.

The Cognition Group
advancing CNS research