Computerized neuropsychological battery detects psychomotor processing speed impairment as the core cognitive deficit in relapsing - remitting multiple sclerosis patients

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Abstract (Summary)

Computerized batteries have demonstrated comparable results to traditional neuropsychological batteries in detecting cognitive impairments in multiple sclerosis (MS) patients and may assist non -neuropsychologist clinicians in obtaining cognitive profiles that would normally require the presence of neuropsychologists. In this study, 30 consecutive RRMS patients and 25 healthy controls were evaluated with the computerized CNS vital signs battery on 5 cognitive domains. Mean performance scores, differed significantly between groups on the psychomotor speed, complex attention and cognitive flexibility domains. Further, 42% (highest proportion) had deficits on psychomotor processing speed and 28% on the cognitive flexibility domain. We conclude that RRMS patients present cognitive deficits even in the absence of significant physical disability. The CNS Vital signs battery could provide the non -neuropsychologist clinician with a reliable screening tool for detecting cognitive deficits in RRMS patients

Introduction

Cognitive dysfunction may contribute to significant limitation of everyday activities in patients with multiple sclerosis (MS), even in the absence of significant physical disability [1]. Recent studies report cognitive impairment in 40-70% of MS patients, involving mainly the domains of memory, executive functions, and information processing speed [2, 3]. Furthermore, a significant increase in prevalence and incidence rates of MS was reported recently in Western Greece [4].

Traditional "paper and pencil" neuropsychological test batteries normally require

Table 1. clinical and demographic characteristics: mean (SD)

Variables	RRMS (n= 30)	Controls (n=25)
*Age	34.6 (8.4)	35.4 (7.6)
*Sex	27 females / 3 males	23 females/ 2 males
* Education (yrs)	12.2 (3.0)	12.7 (2.6)
* § Estimated Intelligence level	98.50 (12.30)	99.40 (11.65)
Disease duration	5.8 (4.6)	-
EDSS (disability status)	2.8 (1.4)	-

*Non significant difference between groups (p <.05) based on parametric *t*-tests (age, education, intelligence level) and x^2 test (sex)

§ Intelligence (IQ) was estimated by administering the vocabulary and matrix reasoning subscales of the Wechsler abbreviated scale of intelligence (WASI), Greek-adapted version [6]

qualified clinical neuropsychologists and lengthy time periods in order to be administered and interpreted correctly.

Computerized batteries have further demonstrated comparable results to traditional neuropsychological batteries [5] and may assist non neuropsychologist clinicians (i.e. neurologists, neuropsychiatrists, other medical doctors) in obtaining cognitive profiles that would normally require the presence of neuropsychologists.

In the present study, (CNS Vital signs ™, Chapel Hill, NC), a recently developed computerized neuropsychological battery which also provides a Greek adapted version was used to investigate cognitive performance in relapsing remitting multiple sclerosis (RRMS) patients in Greece.

Materials and Methods

Thirty (30) consecutive patients with Relapsing Remitting Multiple Sclerosis (RRMS) and 25 healthy controls were evaluated with the CNS vital signs battery on 5 cognitive domains (memory, psychomotor processing speed, reaction time, complex attention, cognitive flexibility) at the department of Neurology, Neuropsychology Section, University of Patras Medical School

None of the patients was on relapse at the time of assessment and did not suffer from major psychopathology or other neurological diseases. All patients were receiving standard disease modifying drugs (see Table 1 for clinical and demographic characteristics of RRMS patients and controls).

Table 2. Neuropsychological performance on the CNSVS Battery: mean (SD)

Cogntive Domain	RRMS	Controls	
Memory	93.8 (8.5)	94.7 (5.8)	NS
*Psychomotor Speed	155.23 (20.68)	177.86 (22.02)	< .05
Reaction Time	682.06 (115.08)	658.97 (82.25)	NS
*Complex Attention	8.8 (6.2)	5.8 (2.6)	< .05
*Cognitive Flexibility	38.4 (15.2)	45.6 (10.10)	< .05

*Significant difference between groups (p <.05) based on parametric *t*-tests

Results

The two groups did not differ on age, education or premorbid intelligence level (Table 1), therefore reducing possible confound effects. Mean scores however, differed significantly between groups as regards cognitive performance, specifically on the psychomotor speed, complex attention and cognitive flexibility domains (Table 2).

Furthermore, using as criterion for impairment (*1.5 standard deviations*) below the performance of the control group on each specific domain, we found that 42% (highest proportion) of our patients had deficits on psychomotor processing speed and 28% on the cognitive flexibility (executive functions) domain.

Discussion and Conclusions

Our findings support the literature that RRMS patients present cognitive impairments when compared to healthy controls [7]. Furthermore, measures of information processing speed appear to be the most robust and sensitive markers of this impairment [8], a finding confirmed by our data.

These results also indicate that the CNS vital signs battery is able to detect cognitive impairments in RRMS patients. Furthermore, it appears to be highly sensitive in detecting psychomotor processing speed deficits in RRMS patients with a low disability status, as were the patients in this study.

We conclude, that RRMS patients present cognitive deficits even in the absence of significant physical disability, and that these patients should be routinely assessed for cognitive decline. The CNS Vital signs neuropsychological battery could provide the non -neuropsychologist clinician with a reliable screening tool for detecting cognitive deficits in RRMS patients.

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