# Is the RehaCom Cognitive Rehabilitation Software Effective in Treating Cognitive Impairment in Multiple Sclerosis?

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**COLUMN ARTICLE**

Cognitive impairment is frequently encountered in MS affecting between 40-65% of individuals, irrespective of disease duration, severity of physical disability, and at both the earlier and later disease stages [1,2], with a tendency to worsen over time [3]. Moreover, cognitive dysfunction in this population may have a significant negative impact on quality of life [4], activities of daily living and independence [5] and employment status [6]. Moreover, past and current pharmacological treatments have shown inconsistent findings in alleviating cognitive impairment in individuals with MS requiring further clarification [7]. This inconsistency regarding the effects of pharmacological interventions on cognition, coupled with the reduced ability to effectively handle everyday tasks, loss of employment and social interaction capacity, and overall poorer quality of life, prioritizes the need for utilizing potentially more effective non-pharmacological, neurobehavioural interventions to address cognitive dysfunction and everyday functioning abilities.

Neurobehavioral interventions utilizing cognitive rehabilitation have shown favorable effects on MS patients cognitive performance and other related skills, and in some cases, have managed to generalize these positive effects to MS individual's everyday life functioning ability, for e.g [8].

While as described previously there is evidence to support cognitive rehabilitation interventions in the MS population, the results of past and present clinical trials have been marred by numerous methodological limitations. These include lack of appropriate control groups and objective neuropsychological status assessment at baseline, utilization of inappropriate randomization methods, single site studies, inconsistency regarding the specific target of the rehabilitation intervention and outcome measures (especially as regards the use of ecologically valid measures), [9].

Therefore, it becomes obvious that there is a need for rigorous new cognitive rehabilitation studies that may overcome some of these limitations and provide robust evidence regarding the efficiency of such interventions.

Our group recently completed a 10 week (2 days a week for approximately 1 hour) multicenter randomized controlled trial utilizing the RehaCom software (RehaCom Cognitive Therapy Software. https://www.rehacom.co.uk) in order investigate its efficacy on cognitive functioning in Greek relapsing remitting MS (RRMS) patients. We hypothesized that patients (n = 32) receiving the specific 10-week intervention will show improved pre to post intervention performance on neuropsychological measures in the related trained cognitive domains relative to control group participants (n = 26) who received only standard clinical

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care. Moreover, we hypothesized that these positive training effects on specific cognitive domains (episodic memory, information processing / attention, verbal fluency and executive functions), would be retained over time (6 months in this case) providing evidence on the long term benefits this intervention. We also hypothesized that control participants will show either further cognitive decline or remain cognitively stable as the period of the intervention may be inadequate to produce significant cognitive changes in these patients.

Clinical (disease duration, EDSS score, type of MS, depression and fatigue levels) and demographic (age, female gender proportion), characteristics including premorbid estimated intelligence level did not differ between our two MS groups at baseline evaluation. We applied a mixed effect ANOVA in order to compare the mean cognitive domain performance difference between the RehaCom intervention group and standard treatment control group (between subject's factor) and the time points (baseline and post treatment) that patients were cognitively evaluated (within subject's factor). Moreover, the interaction of these two factors was evaluated by a two –way mixed ANOVA. We found a significant time x patient interaction on all four domains that we evaluated (Table 1). Moreover, (Figure 1) clearly depicts the significant composite domain performance differences favoring the intervention group.

|  | Verbal Episodic Memory | Attention | Verbal Fluency | Processing Speed |
|---|---|---|---|---|
| Time | 0.628 | 0.727 | 0.767 | 0.662 |
| Patient | 0.171 | 0.099 | 0.047 | 0.522 |
| Time x Patient | < 0.001 | 0.001 | 0.006 | < 0.001 |

**Table 1:** Two - way mixed effect ANOVA for cognitive domain performance: time (within subjects' factor) and patient group: (between subjects' factor).
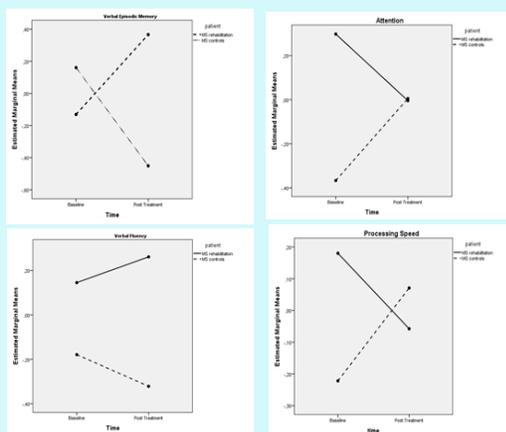
$p < 0.001$***

Our results show that 10-weeks (twice weekly) of functional cognitive training with the RehaCom software distributed equally among specifically trained domains may be helpful in ameliorating impaired verbal memory, processing speed/attention and verbal fluency in RRMS patients. It is also with mentioning that the treatment was well tolerated and accepted with a relatively high compliance rate. Our results confirm the positive outcomes of previous related studies, [10] for a systematic review on the beneficial effects of the RehaCom software in managing cognitive dysfunction in RRMS patients, and other relevant methods of cognitive rehabilitation.



**Figure 1:** Composite cognitive domain performance (z-scores) in the RehaCom intervention and control group at baseline and post treatment.

## CONFLICT OF INTEREST

We have no conflict of interest.

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