# Higher Cognitively Functioning Relapsing-Remitting Multiple Sclerosis Patients Have a More Specific Pattern of Impairment on Neuropsychological Testing

**Sandeep Vaishnavi, MD, PhD, John Barkenbus, MD, C. Thomas Gualtieri, MD**

**NC Neuropsychiatry; Raleigh & Charlotte, NC**

**Objective:** To test the hypothesis of whether early relapsing-remitting multiple sclerosis (RRMS) patients in remission will have a more specific pattern of impairment on neuropsychological testing if divided into high vs. low cognitive functioning groups, and after controlling for motor speed and reaction time.

**Background:** Impairment of information processing speed is often thought to be a crucial component of multiple sclerosis (MS)-associated cognitive impairment. However, MS may also be associated with deficits in attention and memory, working memory, abstract reasoning, and executive dysfunction. There is a high degree of variability in the levels of performance of MS patients at every stage of the disease, and although the classical view is of a "subcorticofrontal syndrome," no typical pattern of deficits may be associated with MS. Diversity in cognitive results in MS may be a function of including patients at different stages of the disease, or because of premorbid cognitive weaknesses or motor impairment.

**Design/Methods:** We used a broad-spectrum array of tests that addresses the domains of complex information processing, working memory, effortful attention, memory, and perceptual ability in a computerized battery (CNS Vital Signs). We had a sample of 42 patients with relapsing-remitting MS (RRMS) currently in remission and between the ages of 18 and 65, and compared their performance with age-matched controls. We divided the groups into those with higher cognitive function (neurcognition index >= 85) and those with lower function (neurocognition index < 85). We used MANOVA analyses, controlling for age, race, gender, education, computer familiarity, finger tapping speed, and overall reaction time.

**Results:** Utilizing data from all 42 patients together, there was a diffuse pattern of cognitive impairment compared to age-matched controls in all cognitive domains tested ($p<0.02$). However, when divided into high and low functioning groups, the high functioning group had a more specific cognitive pattern, with particular difficulties with complex information processing (symbol digit coding, shifting attention test) and working memory. The low functioning group continued to have a diffuse impairment pattern.

**Conclusions/Relevance:** With a cognitively high functioning group of RRMS patients with well-controlled MS, a subcorticofrontal pattern emerges, with particular difficulties with complex information processing and working memory. The cognitive pattern is much more diffuse with the low functioning group, even after controlling for motor speed and overall reaction time. These results could help explain the variance in cognitive testing that can be seen in MS patients.