# ABSTRACT

**The main objective**: The aim of this work is to determine whether lesion load changes after two months of ambulatory physiotherapy based on neurophysiology, whether these changes correlate with clinical outcomes and persist for two months after the end of the program.

**Methods:** This work analyzes the data collected in the study "Neuroproprioceptive" Facilitation, Inhibition "and Brain Plasticity (NEFAI)", registered under the number NCT04355663. Patients with multiple sclerosis (MS) were randomly divided into 2 groups in 2015 and 2017. Each group underwent a different type of outpatient physiotherapy for neuroproprioceptive "facilitation, inhibition", so-called neurophysiological therapy (further in text referred as facilitation therapy) (1 hour twice a week, for a total of 16 therapies in 2 months). The first group underwent therapy using Motor Activating Therapy Programs (MPAT), the second Vojta's reflex therapy (VRL). The entry criteria were a clear diagnosis of MS, the presence of spastic paresis, a stable clinical picture, no changes in therapy in the last 3 months (stabilized state), an Expanded Disability Status Score (EDSS) of maximum values of 7.5. Exclusion criteria were other neurological diagnoses and conditions that prevent movement and all 3 visits were not met (before the start of the program, just after and 2 months after the end of the program). At each visit, patients underwent clinical examinations using the BBS (Berg Balance Score), TUG (Timed Up and Go), MSIS-29 (Multiple Sclerosis Impact Scale) and MSWS-12 (Multiple Sclerosis Walking Scale) and paraclinical examination using magnetic resonance imaging. Then, the transverse plane lesions in each individual layer in the 3D Slicer program were manually demarcated on magnetic resonance imaging under the supervision of a neurologist and the volumes of the these lesions were generated. The Wilcoxon´s test was used to evaluate changes in lesion volumes. Spearman's coefficient (rsp) was used to analyze the correlations between structural and clinical changes.

**Results:**

22 participants (7 men and 15 women) with MS from age 21 to 70 years in the range of 1 - 7.5 EDSS scale were analyzed. Participants differed significantly in age, degree of disability on the EDSS scale, and type of MS diagnosis. The changes in lesion volumes on the magnetic resonance imaging images (lesion load) before and after the two-month therapy based on the neurophysiological basis are inconsistent and statistically insignificant ($p = 0.8237$). Statistically insignificant correlations were found between changes in lesion volumes and clinical scales TUG ($rsp = -0.2045$; $p = 0.3854$), MSWS ($rsp = -0.1205$; $p = 0.5933$) and

Multiple Sclerosis Impact Scale (MSIS -29) (rsp = -0.0845; p = 0.7086). Statistically insignificant, correlations were also found between the BBS scale and the change in lesion volumes (rsp = 0.2427, p = 0.2765).

**Conclusion:** The effect of a two-month facilitation therapy on structural changes in the brain in lesion volumes still appears to be very inconsistent. In our study, we did not achieve significant results of structural improvement after two months of therapy, at the same time, we did not find statistically significant data for the correlation of structural and clinical changes that would have the potential to elucidate the repair mechanisms of the brain and the ability of physiotherapy to affect brain structures in MS. We also did not observe a statistically significant lasting effect of therapy on structural changes.

**Key words:**

multiple sclerosis, lesion load, physiotherapy, facilitation, magnetic resonance, adaptive plasticity, neuroplasticity