Background: Two randomized controlled trials (RCTs) showed that the personalized neuromodulation called Fatigue Relief in Multiple Sclerosis (FaReMuS) efficaciously fights multiple sclerosis (MS) fatigue. By this Proof of Concept study, we tested whether FaReMuS reverts the alteration of the central-peripheral synchronization previously observed occurring with fatigue.

Methods: The cortico-muscular coherence (CMC) was studied in 11 patients before and after FaReMuS, a 5-day anodal transcranial direct current stimulation (1.5 mA, 15 min per day) over the whole body somatosensory representation (S1) via a personalized MRI-based electrode (35 cm2) with occipital cathode (70 cm2).

Results: Before FaReMuS, the CMC was observed at a mean frequency of 31.5 ± 1.6 Hz (gamma band) and positively correlated with the level of fatigue (p = .027). After FaReMuS the rate of fatigue reduction was 28% ± 33% estimated as (post-pre) / pre modified Fatigue Impact scale (mFIS) score and the CMC frequency reduced to 26.6 ± 1.5 Hz (p = .022), thus forthcoming the physiological beta band as observed in healthy people.

Conclusions: The personalized neuromodulation treatment targeting S1 was able to ameliorate the central-peripheral communication, which subtends simple everyday movements. The sensorimotor feedback ameliorated by targeting S1 strengthens the appropriateness of neuromodulations aiming at increasing the parietal excitability in fighting MS fatigue.