

# The effects of mechanical focal vibration on walking impairment in multiple sclerosis patients: A randomized, double-blinded vs placebo study

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## Abstract.

**Background:** Multiple Sclerosis is a heterogeneous disorders involving in early stage gait and balance. Together with immunomodulating therapies, rehabilitation had a crucial role in improving motor tasks and quality of life. Between the emerging techniques, Focal Vibrations (FV) could play a role, but they have been used in MS only to reduce muscle tone and fatigue alone or together with botulinum toxin.

**Objective:** To assess whether FV is effective on walking impairment in a cohort of MS patients.

**Methods:** We performed a single-centre randomized, double-blind, sham-controlled study to investigate efficacy of FV vs sham vibration in 20 RR MS patients. Ten patients received treatment with the active device and ten patients sham treatment. Demographical, clinical and gait instrumental data analysis have been collected for each patient at baseline (T0), after treatment (T1) and after three weeks of wash out (T2).

**Results:** Both groups were clinically and demographically comparable. Treated patients showed significant improvements during the first right step (FRS) ( $p=0.007$ ), average stride length (ASL) ( $p=0.012$ ), double support right (DSRT) ( $p=0.016$ ) and left (DSLTL) ( $p=0.003$ ) time. Non-treated patients didn't show any significance for any dynamic variables. Moreover, on posturographic measurements we registered only a trend towards significance in swing area with eyes open (SAEO) ( $p=0.087$ ). We also found in treated group significant improvements in FRT ( $p=0.018$ ); BBS ( $p=0.037$ ) and FSS scales ( $p=0.038$ ) between T1 and T0. Lastly, we found a significant inverse correlation in the treated group between disease duration and percentage of improvement for DSLTL ( $r=-0.775$ ;  $p=0.014$ ) in T1 vs T0 and percentage of improvement of FSS, with an inverse correlation with both disease duration ( $r=-0.775$ ;  $p=0.014$ ) and AGE ( $r=-0.733$ ,  $p=0.025$ ) in T1 vs T0

**Conclusion:** Our results suggest a beneficial effect of FV on walking impairment in MS patients suffering from spasticity and/or postural instability, which partially lasted until follow up.

Keywords: Multiple sclerosis, neurorehabilitation, focal vibrations, gait analysis

## 1. Introduction

Subjects with multiple sclerosis (MS) experience gait dysfunction due to balance disorders, spasticity and mobility impairment (Feinstein, Freeman, & Lo, 2015) even in the very early stages (Martin et al., 2006). A range of interventions aimed at enhancing

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