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## Mingling of Deafferentation & Non-Weight Bearing with Brain Plasticity with End-Effector Robot for the Elderly

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**Purpose;** End-effector type gait robots (EEGRs) can provide de-afferentation and non-weight bearing patients. Supposed that they can make augmented effect on the stereotyped movement-induced rapid brain plasticity, electro-physiologic, bio-mechanical, computer tomographic comparisons were performed.

**Methods;** A prospective, randomized, controlled trial was conducted. Patients underwent unilateral total knee arthroplasty (TKA) were included. Patients who had central nervous system (CNS) diseases, peripheral neuropathies, myopathies, local muscle injuries around their thighs, impairments of ambulation, decreased consciousness, unstable joints of the legs, history of arthroplasty or cardiac pace maker implantation were excluded. The patients were randomly allocated into two groups; 200-stepping training using EEGR or 200 steps with a walker on a floor (WG) three times a day for five weekdays. Comparisons were performed among the operated, non-operated knee in EEGR and the operated knee in WG.

**Results;** Although no significant differences were noticed in cross-sectional areas and reconstructed 3-dimensional volume of the quadriceps and the hamstrings through computer tomography, the peak torque of the operated, non-operated knee flexors and extensors in EEGR was significantly improved ( $p<0.05$ ). Most compound motor action potentials of the operated, non-operated knee vastus medialis (VM) and biceps femoris long head (BF) in EEGR were significantly increased ( $p<0.05$ ). The standardized mean, peak amplitude of motor evoked potential and the standardized maximal amplitude of Hoffman-reflex of the operated, non-operated knee VM and the BF were also significantly increased in EEGR ( $p<0.05$ ) (Figure 1). Interestingly, peak amplitude and total, mean area under the curve of real-time surface electromyography of the operated, non-operated knee extensors in EEGR were significantly decreased ( $p<0.05$ ).

**Conclusion;** Although real-time use of the thigh muscles was lesser than training on a floor, just five-day EEGR training in de-afferentation and non-weight bearing on the legs might reinforce the stereotyped movement-induced rapid brain plasticity with different cortical, spinal motor neurons excitability in the elderly patient who undertook TKA so that the knee flexors and extensors could be strengthened more promptly, efficiently. It may be useful for leg muscle strengthening in the elderly patients without CNS injuries.