Randomized Controlled Trial Showed Significant Gains in Coordinated Gait Components For Those In the Chronic Phase After Stroke In Response to Motor Learning Coordination Training and Functional Electrical Stimulation.

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Background and Purpose: Many patients not recover normal gait after stroke and conventional rehabilitation. There are few reports of interventions, for persistent gait deficits, that produce gains in coordinated gait components. The purpose of this study was to test an innovative motor learning approach to gait training and the use of a multi-channel functional electrical stimulation (FES) with intramuscular (IM) electrodes (FES-IM) for retraining coordinated gait components.

Methods: We enrolled 50 subjects (_6 months after stroke) with persistent gait deficits. Both groups had treatment composed of 1.5hrs/session, 4sessions/wk, for 12 weeks. Both groups received comprehensive gait training including these three treatment aspects: 1) coordination exercise, 2) body weight supported treadmill training (BWSTT), and 3) over ground gait training. Subjects were randomized to either of two groups: A) No functional electrical stimulation (No-FES; n_24); or B) FES-IM applied during each of the three aspects of treatment; n_26). Primary outcome measures were Tinetti Gait (TG) and Gait Assessment and Intervention Tool (G.A.I.T.). Secondary measures were: leg muscle strength (MMT), isolated leg joint movement coordination (Fugl-Myer (FM)), knee flexion coordination (FMKFx), leg muscle spasticity (Ashworth (ASH), 6 Min Walk Test (6MWT), Tinetti Balance (TB), Functional Independence Measure (FIM total score and Locomotion and Mobility subscales FIML&M). Plum ordinal regression model for ordinal measures was used to test the effect of the intervention (group). Wilcoxon Signed Rank Test was used to test within-groups pre-/post-treatment effect.

Results: There was a statistically significant additive advantage of FES-IM vs No-FES (group difference) for FMKFx (p_.038), TG (p_.017), and G.A.I.T. (p_.008). Both No-FES and FES-IM showed significant within-group pre-/post-treatment effect for MMT (p_.0001, p_.0001), FM (p_.0001, p_.0001), FMKFx (p_.001, p_.0001), ASH (p_.003, p_.009), 6MWT (p_.0001, p_.0001), TB (p_.0001, p_.001), TG (p_.001, p_.001), G.A.I.T. (p_.0001, p_.0001), FIM (p_.008, p_.0001), and FIML&M (p_.025, p_.054), respectively.

Conclusions: In the chronic phase after stroke, coordinated gait components and function can improve in response to a motor learning approach to gait training. FES-IM had a significantadditive advantage in producing gains in coordinated gait components.