

Electromyogram-Triggered Functional Electrical Stimulation-Assisted Walking After Partial Paralysis

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Objective: Functional Electrical Stimulation (FES) triggered by manual switch provides brace-free ambulation to wheelchair dependent individuals with spinal cord injuries. An electromyogram (EMG)-based trigger can enhance the coordination between FES-assisted and volitional actions. This study evaluated the gait speed modulation and coordination of the actions of the EMG-triggered FES with the volitional movements during stand-to-walk transition after incomplete spinal cord injury. **Methods:** two incomplete spinal cord injured (iSCI) subjects (iSCI1: 24 years, C7 motor &

C6 sensory; iSCI2: 34 years, T1 motor & C5 sensory) volunteered for this study. Four able-bodied volunteers provided the normative gait data. The Vicon Workstation™ (Vicon Peak, USA) software acquired lower-body kinematics data using a seven camera motion capture system during stand-to-walk transition. The FES-assisted swing-phase in iSCI subjects was triggered with three command interfaces—manually triggered with a switch, triggered with EMG-based GED, triggered automatically at a user-selected rate. **Results and Discussion:** The Euclidean distance from origin of the perturbations of 18 joint angles and 18 joint velocities during stand-to-walk transition converged towards zero. It was found from the Mahalanobis distances between each pair of group means that the EMG-triggered FES-assisted iSCI gait was closest to the able-bodied normative gait clusters.