

Innovative gait robot for the repetitive practice of floor walking and stair climbing up and down in stroke patients.

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Abstract - Stair climbing up and down is an essential part of everyday's mobility. To enable wheelchair-dependent patients the repetitive practice of this task, a novel gait robot, G-EO-Systems (EO, Lat: I walk), based on the end-effector principle, has been designed. The trajectories of the foot plates are freely programmable enabling not only the practice of simulated floor walking but also stair climbing up and down. The article intended to compare lower limb muscle activation patterns of hemiparetic subjects during real floor walking and stairs climbing up, and during the corresponding simulated conditions on the machine, and secondly to demonstrate gait improvement on single case after training on the machine.

The muscle activation pattern of seven lower limb muscles of six hemiparetic patients during free and simulated walking on the floor and stair climbing was measured via dynamic electromyography. A non-ambulatory, sub-acute stroke patient additionally trained on the G-EO-Systems every workday for five weeks.

The muscle activation patterns were comparable during the real and simulated conditions, both on the floor and during stair climbing up. Minor differences, concerning the real and simulated floor walking conditions, were a delayed (prolonged) onset (duration) of the thigh muscle activation on the machine across all subjects. Concerning stair climbing conditions, the shank muscle activation was more phasic and timely correct in selected patients on the device. The severely affected subject regained walking and stair climbing ability.

The G-EO-Systems is an interesting new option in gait rehabilitation after stroke. The lower limb muscle activation patterns were comparable, a training thus feasible, and the positive case report warrants further clinical studies.