Lokomat

The Lokomat is the world's leading robotic medical device that provides highly repetitive and the most physiological gait training.

Motor impairment and loss of ambulatory function are major consequences of a spinal cord injury (SCI). Exoskeletons are robotic devices that allow SCI patients with limited ambulatory function to walk. The mean walking speed of SCI patients using an exoskeleton is low: 0.26 m/s. Moreover, literature shows that a minimum speed of 0.59 m/s is required to replace wheelchairs in the community.

To investigate the highest ambulatory speed for SCI patients in a Lokomat.

This clinical pilot study took place in the Rehabilitation Center Kladruby, in Kladruby (Czech Republic). Six persons with motor-complete sub-acute SCI were recruited. Measurements were taken at baseline and directly after a 30 min Lokomat training. The highest achieved walking speed, vital parameters (respiratory frequency, heart rate, and blood pressure), visual analog scale for pain, and modified Ashworth scale for spasticity were recorded for each person.

The highest reached walking speed in the Lokomat was on average 0.63 m/s (SD 0.03 m/s). No negative effects on the vital parameters, pain, or spasticity were observed. A significant decrease in pain after the Lokomat training was observed: 95% CI [0.336, 1.664] ($p = 0.012$).

This study shows that it is possible for motor-complete SCI individuals to ambulate faster on a Lokomat (on average 0.63 m/s) than what is currently possible with over-ground exoskeletons. No negative effects were observed while ambulating on a Lokomat. Further research investigating walking speed in exoskeletons after SCI is recommended [1)].

Despite Deep Brain Stimulation (DBS) improves cardinal symptoms of Parkinson's Disease (PD), its effect on walking impairment is less evident. Robotic-assisted rehabilitation systems could serve as “add-on” physical therapy for PD patients. This systems are able to anticipate and correct the trajectory of patients' motion to improve their motor function recovery. OBJECTIVE:

Aim of the present study was the quantitative assessment of the effects of a Robotic-Assisted Rehabilitation Protocol (RARP) on gait patterns by means of three-dimensional gait analysis on PD patients treated with DBS. METHODS:

9 patients with PD treated with DBS were submitted to 5 weeks robotic-assisted rehabilitation sessions. Three-dimensional gait analysis was performed before the starting session, and one day after the last session using an optoelectronic system with passive markers. RESULTS:

The RARP showed significant improvements on spatio-temporal gait parameters and on the Unified Parkinson's Disease Rating Scale motor score.

The RARP with Lokomat may have positive effects on spatio-temporal gait parameters of PD patients and it could be an adjunct therapy for patients treated with DBS. On the other hand kinematic and kinetic gait parameters did not show significant improvements, remaining almost comparable before and after the RARP. [2)].

1)
van Silfhout L, Váňa Z, Pětioký J, Edwards MJR, Bartels RHMA, van de Meent H, Hosman AJF. Highest ambulatory speed using Lokomat gait training for individuals with a motor-complete spinal cord injury: a clinical pilot study. Acta Neurochir (Wien). 2019 Dec 24. doi: 10.1007/s00701-019-04189-5. [Epub ahead of print] PubMed PMID: 31873795.
2)
Nardo A, Anasetti F, Servello D, Porta M. Quantitative gait analysis in patients with Parkinson treated with deep brain stimulation: the effects of a robotic gait training. NeuroRehabilitation. 2014;35(4):779-88. doi: 10.3233/NRE-141173. PubMed PMID: 25318782.

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