Robotic rehabilitation

Robotic rehabilitation has been attracting attention as a means to carry out “intensive”, “repetitive”, “task-specific”, gait training. The newly developed robotic device, the Hybrid Assistive Limb (HAL), is thought to have the possibility of having an excellent effect on gait speed improvement over the conventional automatic programed assist robot. The purpose of this study was to investigate the spatiotemporal characteristics related to gait speed improvement using the HAL in chronic stroke patients.

RESEARCH QUESTION: To investigate the effects of robotic gait training on gait speed and gait parameters.

METHODS: An observational study with an intervention for single group was used. Intervention was conducted in University Hospital. Eleven chronic stroke patients were enrolled in this study. The patients performed 8 gait training sessions using the HAL, 2-5 sessions/week for 3 weeks. Gait speed, stride length, cadence, time of gait cycle (double-limb stance phases and single-limb stance phases) and time asymmetry index were measured before and after intervention.

RESULTS: After intervention, gait speed, stride length, and cadence were significantly improved (Effect size = 0.39, 0.29, and 0.29), the affected initial double-limb stance phase was significantly shortened (from 15.8 ± 3.46%-13.3 ± 4.20%, p = .01), and the affected single-limb stance phase was significantly lengthened (from 21.8±7.02%-24.5±7.95%, p < .01). The time asymmetry index showed a tendency to improve after intervention (from 22.9±11.8-17.6±9.62, p = .06). There was a significant correlation between gait speed and the stride length increase rate (r = .72, p = .01).

SIGNIFICANCE: This study showed that increasing stride length with lengthening of the affected single-stance phase by gait training using the HAL improved gait speed in chronic stroke patients. However, the actual contributions on HAL cannot be separated from gait training because this study is an observational research without a control group [1)].

1)
Tanaka H, Nankaku M, Nishikawa T, Hosoe T, Yonezawa H, Mori H, Kikuchi T, Nishi H, Takagi Y, Miyamoto S, Ikeguchi R, Matsuda S. Spatiotemporal gait characteristic changes with gait training using the hybrid assistive limb for chronic stroke patients. Gait Posture. 2019 May 3;71:205-210. doi: 10.1016/j.gaitpost.2019.05.003. [Epub ahead of print] PubMed PMID: 31078010.