Lokomat Automated Treadmill

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A stroke occurs when a blood clot blocks an artery or a blood vessel breaks, interrupting blood flow to an area of the brain. When either of these things happen, brain cells begin to die and brain damage occurs. When brain cells die during a stroke, abilities controlled by that area of the brain are lost. These abilities include speech, movement and memory. How a stroke patient is affected depends on where the stroke occurs in the brain and how much the brain is damaged.

The Lokomat is a rehab system with robot-assisted lower extremities control made by Hocoma AG Medical Engineering. The device assists walking movements of gait-impaired patients on the treadmill. According to experts in neurology and rehabilitation, the Lokomat system is ideal for use in locomotion therapy. It helps to build muscle mass in partially paralyzed stroke patients. It is adjustable in force, body weight support, and speed to accommodate the abilities of all patients.

The Lokomat system consists of the Lokomat – robotic gait orthosis, and Lokobasis – body weight support system, and is used with a Woodway treadmill. The patient's legs are guided according to a pre-programmed physiological gait pattern. The computer controlled guidance allows individual adjustments of different gait parameters. High quality computer controlled motors are integrated in the gait orthosis at each hip and knee joint. Force transducers at the joints accurately measure the interaction between the patient and the Lokomat evaluating the patient's performance and progress. The motors are precisely synchronized with the speed of the treadmill. This sensitive system assures a precise match between the speed of the gait orthosis and the treadmill. A user interface allows the therapist to easily operate the Lokomat and adjust training parameters to suit the individual patient's needs at any point during a training session. The Advanced Module adds the ability to change the passive guidance characteristics through the guidance force control. A new controller allows the user to switch between position control and resistance free gait modes continuously and without having to stop the training. In the advanced stages of rehabilitation, reducing the guidance force levels encourages patients to work harder. The Advanced Module consists of joint axis Force Transducers, the Light Curtain and the Advanced Software. The Light Curtain is optical light sensors that monitor the patient's feet on the treadmill surface throughout the training session. If the patient trips, the Lokomat and the treadmill will stop immediately. This option allows the therapist to control the training without having to use the operator switch.

The Pediatric Lokomat is available for small children with cerebral palsy or other neurological disorders such as spinal cord injuries, traumatic brain injury, and stroke. This is the first driven gait orthosis for children that automates this process and relieves therapists of the manual labor required during manually-assisted treadmill training. Training sessions can be longer, the therapy is more efficient and it can be expected to achieve desired training goals sooner.

Researchers studied 30 stroke survivors who were randomly assigned to 30 minutes of robotic treadmill training and 30 minutes of conventional physiotherapy daily, or two 30-minute sessions of conventional physiotherapy daily. After 4 weeks, both groups achieved significant and similar improvement in walking ability. However, when walking on the floor, patients in the Lokomat group were able to stand significantly longer on the paralyzed leg. This is important because weakness and sensory impairment in the paralyzed leg will cause the patient to limp. In addition, the Lokomat group lost an average of about 6.4 pounds of fat mass and gained muscle mass of around 7.4 pounds. The conventional physiotherapy group increased their body mass by approximately 2.9 pounds, most of which was fat mass.

Some advantages of the system are physical strain on therapists is relieved, longer training sessions for faster progress, patient walking activity can be easily monitored, assessed and guided, patient motivation is supported through visualized performance feedback, and gait pattern and levels of assistance are adjustable providing just as much assistance as needed.

References

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