Robotics in Pediatric Neuro-Rehabilitation

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What is Lokomat?
Manual Treadmill Training

Mimics functional movement but has limitations:

- Physical strain on therapist
- More than one therapist required
- Limited training duration and intensity
- Limited feedback for patient
- Gait pattern is not reproducible
- Gait pattern is not physiological

Video courtesy of Balgrist University Hospital, Switzerland
Enhanced Gait Therapy with the Lokomat®

• Frees therapists from “mechanical work”

• Enables longer and more intensive training

• Patient receives feedback about performance

• More physiologic gait pattern
What are the requirements to consider children on Lokomat?
Anthropometric Requirements

Body weight must be at least 15 Kgs

The minimum femur length must be at least 21cms
Orthostatic requirements

Sustain a vertical Position

Emergency exit strategies
Optimal Challenge for Learning

Motor Command

Muscle Activity (Movement)

Optimized Guidance and Challenge for Patient’s Movements

Performance Measurement

Intelligent Performance Interpretation
“Practical recommendations for Lokomat therapy: what is the optimal frequency, duration and intensity for my patient?”
How many sessions in a week is recommended?
Handling of Pain

Monitoring the patient

Mild Pain Occuring during the first therapy sessions

Shear forces

The correction of existing anatomical abnormalities

Complaints Persist Despite adjustments
General recommendations for Lokomat training with children with Cerebral Palsy following surgery
Musculoskeletal considerations after surgery

Musculoskeletal deformities

Hip subluxation and dislocation

Asymmetrical leg length

Scoliosis
Pediatric Case Report:

Lokomat with Augmented Performance Feedback in a tetraparetic 9-year-old patient
Before Lokomat training........
How does the infant reduce coxa valga?

Within the constraints left by uterine confinement, she activates the gluteals, starting at age 3 months.

Age 3 months
The Femoral Head and Neck Angle of Entry (AOE)

The **ideal AOE** of the femoral head and neck axis the AIP = $\pm 20$ throughout life.

*Tonnis et al 1987*
How does the child reduce coxa valga?

By engaging in thousands of lateral weight shifts of the pelvis and trunk, starting as early as age 8 months.
Any Questions please....... 

Thank you