Knee weight-bearing in supported standing in children and adolescents with cerebral palsy: Influence of verticalization angle and hip/knee flexion

Aim of the study:

The study investigated the magnitude of **mechanical loading on the knee supports during supported standing in children and adolescents with severe cerebral palsy** and examined the influence of:

- the **verticalization angle** of the standing trainer
- different degrees of **hip and knee flexion**

Research Question:

Does i**ncreasing hip and knee flexion** automatically result in **higher or lower knee loading**?

Study Design:

26 children and adolescents with cerebral palsy

- Age: 6–17 years
- GMFCS IV: n = 9, GMFCS V: n = 17
- Standardised supine standing system
- Measurement of forces at both knee supports
- Total load on both knees expressed as a percentage of body weight

Key Findings:

- **Knee loading increases with greater verticalization angles.**
- Even at **full verticalization (90°), the measured knee loading remained below 50% of body weight** in all positions examined.
- The relationship between joint position and knee loading is non-linear.
- **Slight hip and knee flexion does not necessarily lead to increased knee loading.**

Implications for Clinical Practice:

- **Standing Therapy Despite Contractures:** Hip and knee flexion contractures are not necessarily a contraindication to supported standing training.
- **Individual Adjustment**: Adjustable knee supports allow for targeted pressure distribution, help prevent localised pressure peaks and support safe standing training, even in the presence of contractures.

Key Message:

Standing training is clinically beneficial for children and adolescents with cerebral palsy, even at moderate verticalization angles and in the presence of hip and knee flexion contractures above 40°.



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Foot weight-bearing in supported standing in children and adolescents with cerebral palsy: Influence of verticalization angle and hip/knee flexion

Aim of the study:

The study investigated the extent of **foot weight-bearing during supported standing in children and adolescents with severe cerebral palsy** and examined the influence of:

- the **verticalization angle** of the standing trainer
- different degrees of **hip and knee flexion**

Research Question:

Does **increasing the verticalization angle** automatically lead to **greater foot weight-bearing**?

Study Design:

26 children and adolescents with cerebral palsy

- Age: 6–17 years
- GMFCS IV: n = 9, GMFCS V: n = 17
- Standardised supine standing system
- Measurement of forces at both knee supports
- Total load on both knees expressed as a percentage of body weight

Key Findings:

- **The verticalization angle is a key factor determining foot weight-bearing.**
- At a **verticalization angle of just 60°, more than 70% of body weight was borne through the feet** in most joint positions examined.
- **Hip and knee flexion does not necessarily result in reduced foot weight-bearing.**

Implications for Clinical Practice:

- **Prioritise Verticalization:** The verticalization angle is the most important factor influencing foot weight-bearing.
- **Individual Adjustment**: Individual adjustment of the standing trainer is essential to prevent pressure peaks and ensure safe standing training, even in the presence of contractures.

Key Message:

Effective standing training may still be possible even when full hip and knee extension cannot be achieved due to contractures above 40°, muscle tone or individual anatomical characteristics.



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