

MUSCLE STRENGTH, GROSS MOTOR FUNCTION AND GAIT PATTERN IN CHILDREN WITH CEREBRAL PALSY

Akademisk avhandling

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av

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The thesis is based on the following papers:

- I. Meta Nyström Eek, Anna-Karin Kroksmark and Eva Beckung
Isometric Muscle Torque in Children 5 to 15 Years of Age: Normative Data
Archives of Physical Medicine and Rehabilitation (2006) Aug; 87: 1091-99
- II. Meta Nyström Eek and Eva Beckung
Walking ability is related to muscle strength in children with cerebral palsy
Gait & Posture (2008) 28; 366-71
- III. Meta Nyström Eek, Roy Tranberg and Eva Beckung
Muscle strength and gait pattern in children with bilateral CP
Manuscript
- IV. Meta Nyström Eek, Roy Tranberg, Roland Zügner, Kristina Alkema and Eva Beckung
Muscle strength training to improve gait function in children with cerebral palsy
Developmental Medicine & Child Neurology 2008;50(10):759-64.

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Abstract

Aim

The main purpose was to explore the relationship between muscle strength and walking ability in children with bilateral spastic cerebral palsy (CP), and to analyse whether muscle strength training can improve walking ability.

Another aim was to establish normative values for muscle strength in terms of torque in typically developing children and adolescents, and in relation to sex, age and body weight.

Methods

A total of 174 typically developing children and 63 children with CP between the ages of five and 15 years participated in the studies. Muscle strength was measured with a handheld myometer. Motor function in children with CP was classified with the Gross Motor Function Classification System (GMFCS), graded with the Gross Motor Function Measure (GMFM) and gait pattern was measured with computerised three dimensional gait analysis. Muscle strength training in 16 children was conducted during eight weeks, three times a week.

Results

Normative data for muscle strength showed an increase in torque with age and weight, and strong correlations with both. There were few differences between boys and girls. Equations for predicted torque based on age, weight and sex were developed. Muscle strength in the legs was below predicted values in children with CP. It was lowest in the ankle, followed by muscles around the hip. Weakness increased with severity of motor involvement, strength over 50% of the norm was needed for independent walking. Muscle strength was correlated to walking ability and gait pattern, most obvious at the ankle. The gait moments (torque) in the children with CP were closer to their maximal muscle strength than in typically developing children. With eight weeks of strength training there was an increase in muscle strength, walking ability and push off in gait.

Conclusions

Muscle weakness was found in children with CP, increasing with severity of gross motor impairment and most pronounced at the ankle. There were correlations between muscle strength and walking ability and between muscle strength and gait pattern, most obvious at the ankle. After training, there was an increase in muscle strength and in walking ability and gait pattern.

Keywords: child, muscle strength, reference values, cerebral palsy, motor skills, gait, resistance training