

# First results of the Cologne rehabilitation concept for

## children with reduced mobility



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### 1 Conclusion

Patients with severe impairments of their motor functions were treated with a new physiotherapeutic rehabilitation concept including 6 months of Whole Body Vibration therapy. The patients showed an increase in BMD and muscle mass after 6 months of training. The GMFM reflected a significant improvement in motor function. The increase in muscle mass and bone mass was linear and conclusive to the concept of the "functional muscle-bone-unit".

### 2 Introduction

Patients participating in the Cologne concept of integrative physiotherapy had different underlying diseases leading to reduced mobility. Consequently they were not able to use their muscles physiologically. Due to the immobilisation they are affected from sarcopenia. According to the concept of the "functional muscle-bone-unit" the bone mass adapts to the highest applied forces, which result from their muscles, even in sarcopenic patients. An intensive physiotherapeutic training program should not only increase muscle mass but should also lead to an increase of bone mass.

### 3 Objective

In a retrospective analysis we assessed the first 63 participants of the Cologne rehabilitation concept for handicapped children. Patients characteristics are shown in Tab 1 All had reduced motor functions and most of them were wheelchair bound.

Diagnosis	n	Age range and median	Sex (m - f)
ICP	33	3.4-20.7 (8.4)	17 - 16
MMC	5	2.6-13.8 (8.4)	1 - 4
OI	5	3.9-13,2 (8.4)	3 - 2
SMA	6	3.8-9.8 (8.1)	3 - 3
Others	14	1.5-23.0 (9.1)	5 - 9

Tab. 1: Patient description

### 4 Intervention

The patients completed 6 months of training according to the Cologne rehabilitation concept. This concept included 3 weeks of intensive physiotherapy (split into a start period of 2 weeks and a refresher course of 1 week after 3 months) and 6 months of Whole Body Vibration (WBV) therapy at home. During the time at the rehabilitation center the patients received 4h of intensive physiotherapy per day. A combination of physiotherapy, training in a specially for handicapped children designed fitness-studio, pool-therapy, treadmill-training and WBV was used to improve muscle function and independency in activities of daily living. WBV was applied by the side alternating vibration platform Galileo (Novotec Medical, Pforzheim, Germany).

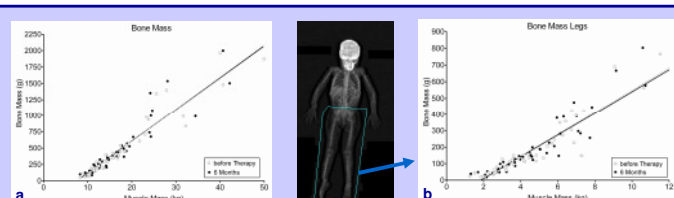


Fig 1. Linear correlation of muscle and bone mass before and after training. Whole body analysis (without head)[a] and analysis only of the legs [b]

### 5 Patients and Results

63 patients were included in this retrospective analysis who completed 6 months of training. The effect of therapy was measured with DXA scans (GE Lunar Prodigy) and with the "Gross Motor Function Measurement Test" (GMFM). The GMFM is a standardized test to evaluate motor functions in children and adolescent with handicap. For practical reasons we used a shortened version which include 30 items (mGMFM). The results of the DXA measurements and the mGMFM are shown in table 2.

According to the concept of the "functional muscle-bone-unit" the results showed that there was a linear increase of muscle mass and bone mass after the training (Fig 1).

Parameter	Changes	p	n
BMD whole body (head excluded from analysis) [g/cm <sup>2</sup> ]	2.1%	0.0001	45
BMC legs/leg length [g/cm]	6.6%	0.0001	45
Muscle mass / body length [g/cm]	2.2%	0.006	47
Muscle mass legs/leg length [g/cm]	3.2%	0.009	45
mGMFM [points]	5.2%	0.001	52

Tab. 2: Results of DXA and mGMFM at start and after 6 months

### 6 Discussion

The analyzed patients were very heterogenic regarding the diseases leading to immobilisation and varied regarding age, sex and severity of motor impairment. All together these first participants showed a significant increase of muscle mass and bone mass in the DXA-analysis. The increase was linear and showed that the concept of the "functional muscle-bone-unit" is appropriate even for children with severely reduced motor functions.

Regarding the GMFM a change of 4% is widely accepted as a relevant change which is beneficial for the daily life of children with a handicap. Consequently the improvements achieved by the rehabilitation program should enhance the quality of life for the participants and their families.

Further studies have to prove the benefit of the rehabilitation concept for different diseases leading to an impaired musculo-skeletal system. Specially the influence of preexisting contractures has to be analyzed. In an ongoing study we are assessing the effect of the rehabilitation program on the quality of life of children and parents.

**Literature:** Results of a prospective pilot trial on the mobility after Whole Body Vibration in children and adolescents with osteogenesis imperfecta Semler O, Fricke O, Vezyroglou K, Stark C, Schoenau E Clin Rehabil. 2008 May;22(5):387-94  
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