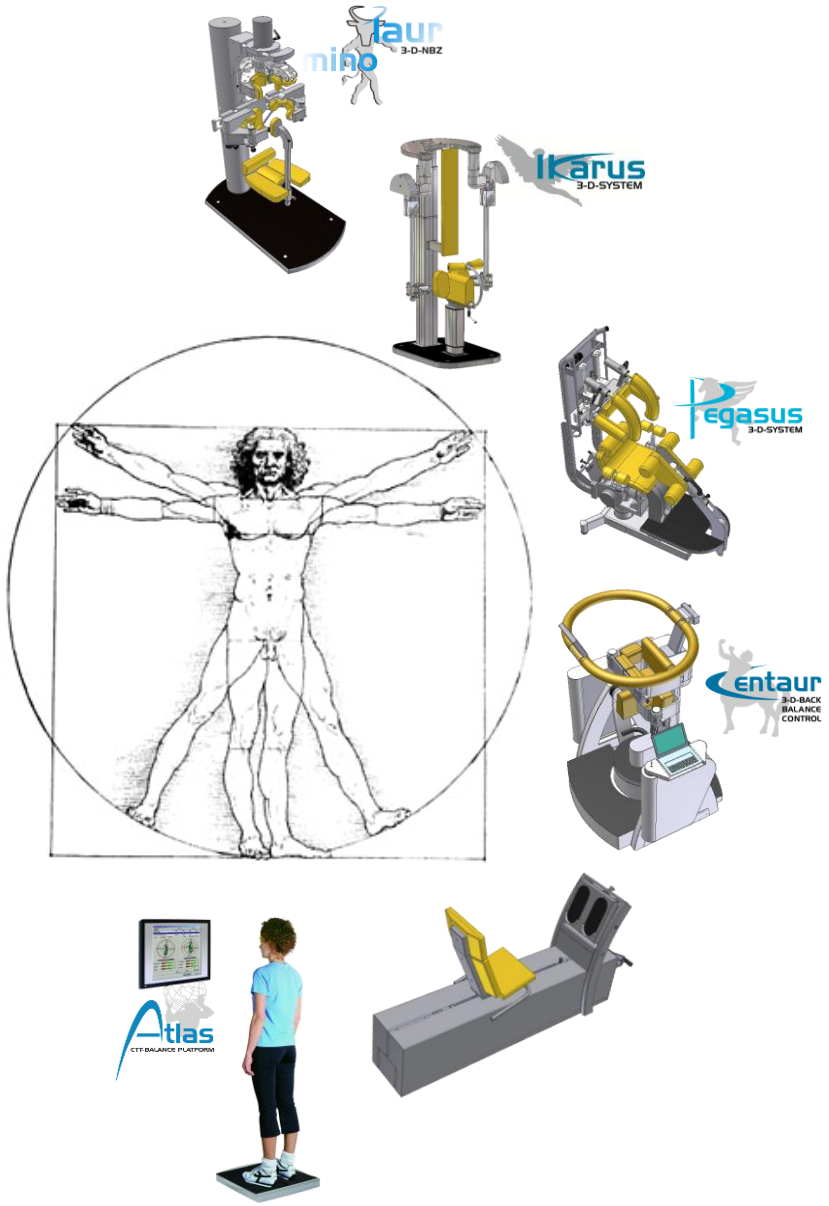


# BIOMECHANICAL LAB

## Complex Diagnosis & Treatment Laboratory

## SKELETAL MOTOR FUNCTION

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## COMPLEX DIAGNOSIS & TREATMENT LABORATORY

# „SKELETAL MOTOR FUNCTION“

## Preamble

Musculoskeletal diseases (problems) cause economic loss in the billions. The increase in efficiency of treatments in the framework of Medical Training Therapy (MTT) and targeted prevention are effective measures for the reduction of effort and improvement of results. The securing of the efficiency of the therapeutic and preventative measures of the MTT is completely dependent on the quality of the diagnosis and the thus resulting targeted dosage of physical strain. The physical strain is the trigger for the active-adaptive reactions, which are the basis of the regenerative processes. Thus strain is a therapeutic. This therapeutic is only effective if the quality of diagnosis, dosability and control of the physical strain exposition is guaranteed.

## Subject of study

From a cybernetic point of view the musculoskeletal system, that is the human movement system, is a psychophysical “bio machine” with an enormous renewal and regeneration (self-healing) potential in case of loss of functionality due to overload or accidents.
The mechanics of this machine consist of 208-214 bones, 187 joints and 639 muscles, which are functionally connected by a great number of ligaments, tendons, cartilage and soft tissue. The spine alone consists of 23 spinal discs, 224 ligaments, 133 joints and 143 muscles.
It is an extremely complex system with a great number of degrees of freedom.
The securing and realization of the functionality of such a movement system is realized through the enormous control and regulating capabilities of the central nervous system and the existence of a great number of powerful sensomotor drives that can be controlled and regulated. Each muscle with its control and regulation on the spinal and supraspinal regulation levels is such a sensomotor drive.
The human motion function thus has 639 sensomotor drives.

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## Most common causes of problems

The impairment of performance of the motion function and the resulting problems are in the majority of cases (for the back in 85 per cent of cases) a result of developing deficiencies in the control programmes of the sensomotor function. This can lead to neuromuscular imbalances or neuromuscular deficits of the joint motor function. Muscular **imbalances and deficits** are also the causes of diminished resilience of the joint stabilising musculature. Thus a permanent overload is created, which in turn can lead to pain, sometimes lasting pain.

The causes for the emergence of neuromuscular imbalances and deficits can be found in our modern way of living:

| | |
|---|---|
| **Immobility** | Cause of muscular deficits |
| **Bad/Wrong Posture** | Cause of muscular imbalances |

## Treatment aims

The most important treatment aims are:

- ***Identify*** existing **neuromuscular imbalances and deficits**
  and **coordinative deficits of the skeletal musculature** (sensomotor function) and

- ***Eradicate*** these through targeted strain in the framework of a medically controlled functional training (MTT)

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## Performance parameters of the required equipment

The functional complexity of the musculoskeletal system requires a number of specialised device systems, which in their totality constitute the equipment of a biomechanical lab.
The following computer-supported test and treatment systems by BfMC are the basis of such a laboratory:

| | | | |
|---|---|---|---|
| 1. Minotaur | Diagnosis and treatment system for the | **Neck** | **skeletal motor function** |
| 2. Ikarus | Diagnosis and treatment system for the | **Shoulder joint** | **skeletal motor function** |
| 3. Pegasus | Diagnosis and treatment system for the | **Back** | **skeletal motor function** |
| 4. Centaur | Diagnosis and treatment system for the | **Back** | **skeletal motor function** |
| 5. Titan | Diagnosis and treatment system for the | **Foot/Knee/Hip** | **skeletal motor function** |
| 6. Atlas | Diagnosis and treatment system for the | **Body Balance** | **skeletal motor function** |

Each of these device systems:

- Accounts for the three dimensionality of the musculature through real 3D testing and training
- Allows for the identification and reduction of neuromuscular imbalances and deficits:
    - Neuromuscular imbalances are identified through measuring the exertion of strength and of the range of motion in the anatomical main planes and through comparison of the results
    - Neuromuscular deficits are identified through measuring the exertion of strength in the anatomical main planes and through comparison of the results with specific reference values
    - Neuromuscular imbalances and deficits are reduced through creation of a defined strain on the skeletal sensomotor function through a defined and well dosed load

- Allows for an exact dosage and definition of the structure of physical strain (important to achieve therapeutic effects) through Biofeedback training:
    - Capture of individual data
    - Definition of training structure
    - Control of the trainings through online biofeedback methods
    - Display of results, documentation and archiving

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**1. Minotaur**

Diagnosis and treatment of neck problems

3D CTT MINOTAUR
Three dimensional computer-supported test and training device system

- Measurement of the range of motion of the cervical spine in the transversal plane.
- Measurement of the exertion of strength of the musculature of the cervical spine in the anatomic main planes
- Measurement of the exertion of strength of the joint motor function of the thoracic and lumbar spine segment in an upright sitting position
- Objectifying of existing imbalances and deficits, determination of treatment aims
- Execution of a specific training (treatment) of the sensomotor systems of the cervical spine joint motor function under isometric and auxotonic working conditions
- Documentation of the healing process

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## 2. Ikarus

Diagnosis and treatment of shoulder problems

3D CTT IKARUS
Three dimensional computer-supported test and training device system

- Measurement of the range of motion of the shoulder joints
- Measurement of the exertion of strength of the musculature of the shoulder in any measuring position of the anatomic planes of the shoulder joints
- Objectifying of existing imbalances and deficits, determination of treatment aims
- Execution of a specific training (treatment) of the sensomotor systems of the shoulder joints under isometric and auxotonic working conditions
- Documentation of the healing process

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**3. Pegasus**

Diagnosis and treatment of back problems

3D CTT Pegasus
Three dimensional computer-supported test and training device system

- Measurement of the range of motion of the spine
- Measurement of the exertion of strength in any measuring point of the anatomic planes of the thoracic and lumbar spine joint motor function
- Objectifying of existing imbalances and deficits, determination of treatment aims
- Execution of a specific training (treatment) of the sensomotor systems of the thoracic and lumbar spine joint motor function under isometric and auxotonic working conditions
- Documentation of the healing process

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## 4. Centaur

Diagnosis and treatment of back problems

CTT Centaur
Three dimensional computer-supported test and training device system

- Three-dimensional computer-supported training for the muscles of the lumbar spine segment including those on the side and the stomach muscles
- Objectifying of existing imbalances and deficits in the lumbar spine segment, determination of treatment aims
- Execution of a specific training (treatment) to eradicate existing imbalances and deficits
- Controlled activation of the autochthonic back musculature, initiated through instrumental proprioceptive neuromuscular facilitation (PNF)
- Cardio-pulmonary training through straining and relieving the blood vessels in tilt
- Isokinetic training device
- Documentation of the healing process

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**5. Titan**

Diagnosis and treatment of Foot-Knee-Hip problems

CTT IsoLegPress TITAN
Computer-supported test and training device system

- Measurement of the exertion of strength of the lower limbs in any angle or position (left/right, simultaneously or consecutively)
- Objectifying of existing imbalances and deficits, determination of treatment aims
- Execution of a biofeedback training (treatment) of the lower extremities (foot, knee, hip joints) under isotonic (auxotonic), isokinetic and isometric working conditions)
- Documentation of the healing process

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## 6. Atlas

Diagnosis and treatment of body posture

problems

3D CTT Balance Platform ATLAS
Three dimensional computer-supported test and training device system

- Determination of the distribution of the body weight onto the legs
- Execution of balance tests
- Objectifying of existing imbalances and deficits, determination of treatment aims
- Execution of different training programmes: Training to equally distribute the body weight onto both legs in the standing position; conscious control of the centre of gravity of the body; strength endurance - biofeedback training of the sensomotor function of foot, knee and hips (knee bend ergometer)
- Documentation of the healing process

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SLG Prüf- und Zertifizierungs GmbH

# Certificate

SLG Prüf- und Zertifizierungs GmbH herewith certifies
that the company

**BfMC Biofeedback Motor Control GmbH**
**Naumburger Str. 28**
**04229 Leipzig, Deutschland / Germany**

for the scope

**Development, manufacturing, production and distribution of computer - aided training machines and appliances for prevention and vital protection**

implemented and uses a

**Quality Management System**

that complies with the requirements of

**DIN EN ISO 13485:2010**
**(EN ISO 13485:2003 + AC:2009)**

The assessment is documented in
audit report no. 5001-10-PP-11-QB002

This Certificate is valid until

**26.01.2015 .**

The Certificate is registered under no.

**106388M6**

Akkreditiert durch
Zentralstelle der Länder
für Gesundheitsschutz
bei Arzneimitteln
und Medizinprodukten
ZLG-ZQ-660.01.04-46

**Hartmannsdorf, 31.01.2011**

U. Schult
**Zertifizierungsstelle**

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BfMC Biofeedback Motor Control GmbH
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for prevention and vital protection

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