Zürcher Hochschule
für Angewandte Wissenschaften

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Gesundheit

Movement Analysis: Our know-how, your gain

Our physiotherapy science research centre promotes the quality of physio therapy through its involvement in applied research projects, consulting and training. The development and integration of new technologies, physiotherapeutic diagnostic assessment and studies into the effectiveness of new treatment methods stand at the forefront of our activities.

Research, development and consulting in the movement laboratory

We analyse movement sequences and muscle activity using state-of-the-art technology in our movement laboratory.
This enables the precise detection of abnormalities, such as movement asymmetries or incorrect loading stresses. Simultaneously, we improve our understanding of how therapeutic aids and interventions, such as exoskeletons, robotics, orthoses, shoes or a targeted training, can have an impact on movement and health.
Our employees are experts in the fields of physiotherapy and movement analysis. Together with our project partners, we work to close the gap between development and implementation.
We understand both the concerns of patients, as well as the requirements of the medical professionals applying these new developments, thus benefitting our clinical partners, researchers, product developers in the medical technology industry – and ultimately patients.

Our core competences: 3D movement analysis and electromyography

In 3D movement analysis, reflective markers are placed at specific points on the body. These markers are registered by infrared cameras in the laboratory and, using biomechanical models, we generate 3D movement data. We also have the capability to perform electromyography measurements through the attachment of electrodes to the skin.
In this way, we can:

- **Calculate joint angle:** The joint position is calculated from the locations of individual markers and the consequent movement sequence recorded.
- **Measure forces:** The magnitude and direction of the forces acting on the body can be determined using force plates.
- **Determine moments:** The combination of movement and force measurements makes it possible to determine the moments of forces on the joints and so to detect load peaks and overloads during a movement sequence.
- **Record muscle activity:** We observe how muscle tension develops during a movement sequence and how the muscle reacts to the forces acting on the body.
- **Carry out functional measurements:** We measure balance, coordination, speed and strength in the everyday environment. We also analyse gait in simple and complex situations.

Reference projects

In cooperation with partners from research, clinical care and industry, we have implemented a variety of projects. A selection is outlined below:

- **Development of a soft, adaptable exoskeleton for people with walking impairments.**
  Project partners: Institute of Mechatronic Systems ZHAW; four further European research groups from the fields of robotics, bioengineering, ambient intelligence and design; and four companies and clinical partners from the fields of rehabilitation technology, geriatrics and prosthetics.
- **Valedo neck therapy:** Improvement of movement therapy for the cervical spine through computerized training, feedback and progress monitoring. Development of a new mobile measurement technology and integration of this technology into new neck-specific software. Further development of the therapy according to the «user-centred design principle».
- **T-Chair:** The T-CHAIR is a robotic rehabilitation device to regenerate the trunk muscles and to improve balance while sitting for stroke patients. The chair was developed by the IMES Institute for Mechanical Systems. The requisite kinematic analysis of the 3D movement of the trunk was performed in the movement laboratory. A user study is being carried out in cooperation with the Rehabilitation Clinic Valens. In December 2017 a European follow-up project was started with partners from Belgium, financed within the framework of the EU «Eurostars» programme. The aim is to further develop the technology and bring it to market maturity.
- **Back health of the horse population in Switzerland:** In more than ¾ of sport and recreational horses shown to a veterinarian for problems with performance or rideability, subclinical diseases of the musculoskeletal system are the cause of the symptoms. An inventory of the back health of Swiss riding horses was undertaken in this study. An important component was the development and application of physio-therapeutic and sport-specific tests. The findings of the study are to be incorporated into the training and further education of horse specialists, as well as the basic education of recreational riders.

Our equipment

Both stationary and mobile instruments are available in our movement laboratory:

- Force plates and twelve infrared cameras for 3D movement analysis
- Wireless 16channelsurfaceelectromyography for measuring muscle activity
- 3D inertial measurement system for mobile movement analysis
- Acceleration sensors
- Portable walkway system for gait analysis
- Mobile devices for recording everyday physical activity

Advice and Contact

Would you like to put one of your product developments to the test, or measure the effectiveness of your treatment approach by means of movement analysis, e.g. walking?
We would be pleased to advise you personally and support you with tailor-made solutions for your project. Please do not hesitate to contact us.

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