in a variety of multidisciplinary projects with partners ranging from orthopaedic device producers through health professionals to automotive industry. The main topics of basic and applied research involve using engineering techniques to solve orthopaedic problems and develop new orthopaedic devices, understanding mechanical properties of tissues of cardiovascular system and application of advanced experimental methods in cell mechanics. Division of Biomechanics provides education in master study program Biomechanics and medical devices and Ph.D. study program Biomechanics.

Biomechanics research in Faculty of Physical Culture Palacký University Olomouc and Human Motion Diagnostic Center University of Ostrava

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The biomechanical research activities of both departments deal with biomechanics of basic human motions in various groups of subjects, biomechanics of sport and physical activity. The most often used methods are: 3D kinematics (Vicon MX, Qualysis), ground reaction force measurement (Kistler), pressure distribution analysis (Footscan), electromyography (Delsys). Recently Olomouc group solve projects mainly in following topics: assessment of static and dynamic balance in various groups (young, middle age and older groups; subjects with amputations), the effect of rehabilitation on gait and balance in ballet dancers, the effect of treatment (surgery, orthotic, rehabilitation intervention) on gait in orthopaedic patients (knee, hip osteoarthrisis). Ostrava group nowadays solve, for example issues as the biomechanics of pathological running in people after Achilles tendon surgery, biomechanical risk factors for knee injury in volleyball, biomechanics of walking in people with a bionic knee after transfemoral amputation, the kinematics of vaults in gymnastics or load optimization in strength exercise.

Hemi-epiphysiodesis at the knee region: long - term results of Ambulant Centre for Defects of Locomotor Apparatus in Prague

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The Ambulant Centre for Defects of Locomotor Apparatus in Prague has achieved very good results with permanent epiphysiodesis that was carried out both in cases of unequal leg length and at deformities around the knee joint. The goal of the communication is to present our last ten years of experience with anthropometric measurement of tibio-femoral angle, indication and timing of the surgery and long-term results of permanent hemi-epiphysiodesis (carried out by modified Macnicol´s method using drilling of growth physis) that was indicated to children

with deformities around the knee joint region. Hemi-epiphysiodesis (HE) was indicated to growing children suffering from the knee joint deformities caused by idiopathic, metabolic, neuromuscular, genetic skeletal disorders. Partial permanent medial or lateral HE of distal femoral physis and/or proximal tibia one was done in a cohort of 28 patients aged 10.4 – 15.95 years. Totally were made 47 medial and 10 lateral hemi-epiphysiodesis. Average age of surgery was 13.27 ± 1.31 years. Valgosity was indicated to HE in children with both the idiopathic cases (obesity, hypermobility) and in multiple exostoses, bone dysplasias (BD), etc. In patients with valgosity the average T-F angle was 13.62° ± 4.08° measured before surgery, the angle was normalized to 4.4° ± 1.39°. The evaluation showed that intermalleolar distance was decreased from 8.1 cm ± 2.63 cm to 0.91 cm ± 1.29 cm. Varosity was indicated to HE in children with bone dysplasias (achondroplasia, pseudoachondroplasia, hypophosphatemic rickets etc.). Average T-F angle in these cases was -13.63° ± 2.29° measured before surgery, the angle was changed to -9.75° ± 2.36°. Intercondylar distance was decreased from 3.38 cm ± 1.25 cm to 2.2 cm ± 1.68 cm. In the right time indicated modified drilling HE by Macnicol results to excellent correction of tibio-femoral angle. Worse results were gained in patients with bone dysplasias and varosity of the knee joints due to difficult prediction of remaining growth and late carrying out of the HE. In BD cases we begin to use so-called „guided growth method" which uses the special 8-plates in last two years. The correction of the biomechanical axis of legs by HE is a mini-invasive surgical procedure that is indicated with the aim not only to prevent premature osteoarthritis of the knee joints but it improves the posture, walking stereotype and visual aspect, too.

Laboratory of Biomechanics of Extreme Loading

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Laboratory of Biomechanics of Extreme loading is a research and educational experimental place by the Department of Anatomy and Biomechanics of Faculty of Physical Education and Sports of Charles University. Since its opening in 2004, the laboratory is focused on the study of kinematic and dynamic parameters of different human movement activities, which are followed by research of rheological properties of native and artificial tissues and materials. The laboratory has at disposal devices designed by own development (rheometer, microtester, analytical work and sports equipment...) that complement and extend the capabilities of owned commercially available top-technologies (Kistler, Qualisys, Dewetron...). These technical background along with a stable staff base consisting primarily of the staff and PhD students of the Department of Anatomy and Biomechanics allows to apply an advanced biomechanical approach also in matters of forensic and injury biomechanics. An important component of the work of the lab is represented by huge grant activities and large contract research. The laboratory is also effectively used in support of Bc., Mgr. and especially of Ph.D. studies both for demonstrations in teaching process and by solving the theses topics.

THIS ACTION IS REALIZED BY THE PROJECT NEXLIZ – CZ.1.07/2.3.00/30.0038, WHICH IS CO-FINANCED BY THE EUROPEAN SOCIAL FUND AND THE STATE BUDGET OF THE CZECH REPUBLIC.