METHODOLOGICAL CHALLENGES FOR BIOMECHANICAL APPOACHES IN WINTERSPORTS

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Abstract

Many research questions related to performance or to injury prevention require biomechanical approaches and study plans that provide the best achievable compromise between internal and external validity. This is especially true for winter sport activities like skiing which cannot adequately be reproduced under laboratory conditions. The keynote presentation will illustrate how these methodological challenges have been addressed to answer three of the currently most researched questions in wintersports

(1) the loading of the hip joint at different skiing manoeuvers (to answer the question if skiing is recommendable sport for people with hip replacement),

(2) the effectiveness of wrist guards for the prevention of wrist or lower arm fractures in snowboarding

(3) the development of algorithms for mechatronic ski bindings with the target to reduce the unchanged high rate of knee injuries.

Each one of these three research projects comprises of a variety of methods. For the determination of the hip joint loads, full body motion capturing on the snow, combined with differential GPS and ground reaction force measurements delivered the input for an inverse model. In our wrist guard study simulated falls in the lab provided the input data for a multi-body and finite element model to simulate stress and strain of both os radius and os ulna with and without wrist guard. To develop the mechatronic binding and to systematically investigate its potential to reduce loads to the anterior cruciate ligament, an artificial knee joint with full muscle control has been realized. The keynote will give the method overview and the results derived for each of these three projects.

Professor Veit Senner's bio

Date of birth: 10th of May 1959, Nationality: German

1989 after having graduated from Technische Universität München with an a cademic degree in Mechanical Engineering he continued studying at the same University and graduated 1995 with the second academic degree in Sports Science. At the same time Prof. Senner started his industrial career at TÜV Süddeutschland, the German leading testhouse. In 2000 Prof. Senner became Department Manager within Business Unit Medical Health Sports.

During his time in industry he continued to work on his University career, receiving his Ph.D in Mechanical Engineering (Dr.-Ing.) in 2001. One year later he has been appointed as Associate Professor at TUM-Technische Universität München and head of Speciality Division Sport Equipment and Materials.

His major research area is biomechanics related to human equipment interaction by means of computer simulation. Between 2005 and 2009 he has served as Associate Dean for the Faculty of Sport Science. Prof. Senner is President of Germany's Interdisciplinary Association for Sports Technology (divers) and he is member of Executive Committee of International Sports Engineering Association. He serves as Vice President of the International Society Skiing Trauma and Safety and President of the Association Snow Sport Education at German Universities. He has published more than 100 articles in national and international journals as first and co-author