Introducing Human Locomotion Analysis into the Medical Curriculum at the University of Zagreb

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Introduction

At the University of Zagreb, the Faculty of Kinesiology was the only site to teach locomotion biomechanics to undergraduates. Following the need to teach biomedical engineering students interested in this interdisciplinary subject as well, at the Faculty of Electrical Engineering and Computing a new elective course-bordering between biomechanics and robotics, and supported by the textbook (Medved, 2001a),-has been introduced a few years ago. It is called: "Multisensor Systems and Locomotion" (Medved, 2000, Medved, 2001b). Further, a new elective course is presently being offered to students of Medical School, entitled: "Measurement and Analysis of Human Locomotion", and it is to be described in this paper.

Methods

To implement successfully a certain new professional area, both educational efforts and adequate financing of equipment are needed. In human locomotion study, the first prerequisite has been partially fulfilled by the previously mentioned course. The second prerequisite has also been fulfilled recently by equipping a new gait laboratory at the Faculty of Kinesiology. One has been able, therefore, to design a new elective course suited to undergraduate medical education.

Results

Inverse dynamic approach, being a central methodological paradigm in biomechanical study of locomotion, is explained first. Experimental measurement methods concerning 3D kinematics, ground reaction force kinetics and multichannel surface electromyography (EMG) are then described. Gait, a principal locomotor pattern is discussed, and its basic clinically recognizable pathologies are identified. Computerized locomotion laboratory setting serves for a number of clinical measurement applications and case studies. Experimental and model-generated data are interpreted in the context of the underlying physiological system (mal)function. Biomechanical data, combined with expert knowledge, are integrated in the comprehensive diagnosis- and clinical decision-making picture. Improved differential diagnostics of various locomotor pathologies is thus enabled, being applicable in rehabilitation follow-up, pre-surgery planning and post-surgery evaluation, prostheses of extremities evaluation, etc. (Pecina and Bojanic, 2003). Computer simulations linked to robotics- and virtual reality-aspects of locomotion are also enabled, which may be used for teaching and training (simulation of surgery) purposes.
Interdisciplinary tailored faculty team includes biomedical, clinical and mechanical engineers, medical specialists, and kinesiologists.

Discussion

This course is aimed at teaching the student clinically relevant locomotion measurement methods, as well as appropriate analytical methods of system modelling. It is aimed at helping to build a modern medical doctor.

Conclusion

A successful implementation of the new course is expected together with its gradual positive impact on better health care.

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