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Dr. Hayri Ertan completed his doctoral study in Exercise Neurophysiology at Middle East Technical University, Physical Education and Sports Department in common project with Hacettepe University, Biophysics Department. Dr. Ertan specializes in the neuromuscular control strategies especially during the load on human body. He has also worked on Auditory Evoked Brain Potentials. Between the dates of September 2005 – September 2006, he has received the ‘German Academic Exchange Program (DAAD)’ scholarship and worked at German Sports University, Cologne as guest researcher. He is the founder of Movement and Motor Control Laboratory of Anadolu University. He and his research group continue on the evaluation of high-level sport performance.

Decomposition of Human Movement by using Neuro-Mechanical Methods

Assessing human movement is central to numerous laboratory tests, especially when high-level sportive performance is in question. One of the methods evaluates the neural procedures that effect the human movement (Ballanger, B., and Boulinguez, P. 2009). The second aspect of the evaluation of human movement is the usage of kinetic and kinematic variables. As long as there are many other aspects of performance testing, evaluating the motor performance from neural and biomechanical aspects may supply important clues on the performance sub domains. The combination of these two aspects together may be named as Neuro-mechanical evaluation of human performance. Neuro-mechanical evaluation of motor abilities needs the synchronous usage of kinetic and kinematic aspects. To supply information on neural drive, kinesiological electromyography (EMG) is used. In general, EMG signal incorporates central control strategies, signal transmission along nerve fibers and across neuromuscular junctions, electrical activation of the muscle fibers organized in elementary motors and through a chain of complex biochemical events, the production of forces acting on the tendons of the agonist and/or antagonist muscles and moving the bones (Cerrah et. al., 2010).

The kinesiological or surface EMG (sEMG) has an important role in the field of sport sciences because it is either easy to use or provides high correlation between skeletal muscle activation and force (Cerrah et. al., 2010). sEMG may be used either alone or in combination with other methods like kinematic and kinetic variables to evaluate the motor performance. sEMG is mostly used to evaluate the muscular activation strategies during a given task. Besides, it accompany with some kinematic data like angular velocity, speed etc. It is also used in combination with the force outcome values. The relationship between EMG-force is one of the biomechanical aspects for decomposing the sportive abilities. Beside the synchronization of EMG with force platforms, researchers also need to use high-speed cameras in addition to these two systems at the same time. So, the data gathered from EMG, force plates and high-speed video recordings are very useful for dividing motor abilities into its parts or decomposing them.

The purpose of the invited session is to supply information on the synchronization of these systems all-together and gathering data for decomposing the sportive abilities into its parts. Some experiences from the field applications from both the literature and Human Movement Motor Control Laboratory of Anadolu University will be shared with participants during the session.

References:

- Ballanger, B., and Boulinguez, P. (2009). EMG as a key tool to assess motor lateralization and hand reaction time asymmetries. *Journal of Neuroscience Methods* 179 (2009) 85–89.
- Cerrah, A. O., Ertan, H., Soyulu, A.R. (2010). Evaluating Force with Electromyography. *Turkiye Klinikleri J Neur* 2010; 5(3):160-6.