it's internal processes and its general functionality are uninterrupted and efficient in converting entries in exits;

-examples: the productive work environment and the satisfaction grade felt by the employees of the organization.

From the perspective of system resources, a sportive organization is considered efficient if it can win the resources that it necessitates out of the environment in which it works.

-examples: government funds, sponsors

Concluding, we can affirm that, the organizing performances and effectiveness are determined by a variety of factors and variable internally and externally. On an internal plan, the leadership processes intervene at all managerial levels and play a major role.

In the attempt to identify the determinants of the act of leadership efficacy, researchers have concentrated their attention over power, features, aptitudes, behavior, and situational conditions that elucidate the way in which managers are capable to influence subordinates to accomplish organization objectives.

As how H. Mintzberg. Observes, any review of the side that refers to the science of leadership will highlight the fact that there are a lot more known about this subject than it is recognized.

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EXPERIMENTAL RESEARCH REGARDING MUSCLES ACTIVITY

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Abstract:

The paper presents some experimental research regarding muscle activity using electromyography. The aim of this experimental study is to determine the biceps activity using non-invasive electrodes, during flexion-extension movement of the forearm, as voluntary movements. These motions are caused by the isotonic contraction of the aforementioned muscle. We were able to identify the phases of the muscle activity, consisting of: the inactivity phase; the loading phase, the maintenance phase; the primary discharge phase; the motion stabilization phase, the secondary discharge phase and the inactivity phase.

Key-words*: EMG, muscle activity, upper limb biomechanics*

INTRODUCTION. STATE OF ART

Electrical activity of biological systems is the main condition of their integration in the environment [Baciu I., 1997]. The electrical activity is located at the excitable cells membranes which are receiving signals from both internal and external environment, which are transmitting the processed information followed by a dynamic response.

Using macroscopical electrodes (superficial or invasive) or microelectrodes, we can record the potential differences at the level of biological structures.

In both cases, the electrodes are designed to convert the currents carried by electrolyte ions in the biological solutions, into currents carried by free electrons (conduction) in metals. The electrodes are made from the same material in order to ensure the compatibility of measured bio-potential. The electrode potential rapid fluctuations define electrode noise, and the electrode potential slow fluctuations define the drift. Nowadays, the best performance and the widest use electrodes are those made of Ag/AgCl [Baciu I., 1997].

EMG is a non-invasive method of paraclinical investigation studies which provides information on the bioelectrical activity in the striated muscle, while the muscle is relaxing or contacting, respectively in normal and pathological conditions [Szilagyi T., 2008].

The collected electrical signals are processed by amplification, by filtering, followed by graphical representation (an oscilloscope screen or paper tape) or saving. In recent decades the conversion of analogue to digital (A / D) followed by computer processing of signals has become increasingly widespread.

The aim of our experimental study is to determine the biceps activity using non-invasive electrodes, during flexion-extension movement of the forearm, as voluntary movements [Nemes D., 2006]. These motions are caused by the isotonic contraction [Nenciu G., 2005, Todea SF 2006, Postolache N. 2007] of the aforementioned muscle.

TECHNICAL SUPPORT

The BIOPAC system is used to analyze biomedical signals, suitable for universities, hospitals, pharmacies and research institutes. The system consists of sensors, electrodes, amplifiers, recording accessories and software components.

There are various applications of this program, such as ECG, EMG, EEG, polygraph, measuring the pulmonary activity, monitoring athletes; measuring blood pressure.

The apparatus consists of (Fig. 1): computer with AcqKnowledge program installed, data acquisition station Biopac MP150 (A), stimulation module STM100C (B), signal amplifier UIM100C (C), external module EMG100C (D), cables (LEAD108 and LEAD110S-R), modular extension cord MEC111C; sensors EL503.

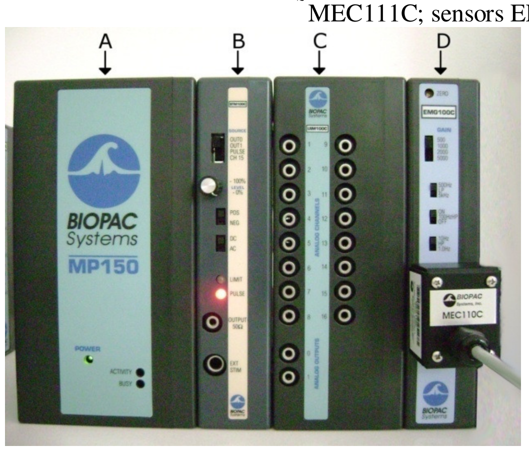

Fig.1. BIOPAC System

AcqKnowledge as a component of BIOPAC acquisition system is intuitive and interactive software, which allows viewing, measuring, analyzing and transforming data.

AcqKnowledge can perform the following tasks:

- Monitoring data acquisition, i.e. establishing the recording channels, calibration, acquisition and conversion setting parameters analogue / digital, defining mathematical functions for online processing of waveforms;
- Storing data recorded in computer memory or on other media and handling the records;
- Discrete signal processing after registration, i.e. mathematical, analytical functions, frequency analysis, filtering, static functions;
- Accessing a proper editor (journal) which allows the setting of certain comments or measurement results, specific to a set of records.

EMG100C component is the external data acquisition module which enhances the bio-potential that characterizes the electrical activity of striated and skeletal muscle.

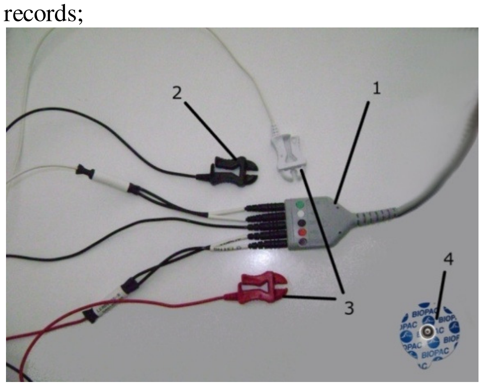

Fig.2. Connecting elements

1-Modular extension MEC111C; 2- cable LEAD110; 3- cable LEAD108; 4-sensor EL503.

EL503 sensors are surface sensor for general purpose providing excellent records for all bio-potential signals. These sensors are self-adhesive and so, using a special gel for application is not needed. The sensors are made of vinyl, with a diameter of 35mm and a contact area of about $10mm^2$.

In order to measure the electrical activity of a muscle using electromyography it is necessary to use three surface sensors type EL503: two sensors are applied to the skin covering the muscle to be examined, first sensor placed at the proximal end, the second sensor at the distal end of muscle and the third sensor is applied in a neutral zone.

1. THE EXPERIMENTAL STAGE

In order to a proper evaluation of muscles activity using EMG technique, some requirements must be regarded:

- The ambiental temperature should be between 20-25°C (lower temperatures might disturb the EMG recording because of the involuntary muscle contractions caused by chills) [T. Szilagyi, 2008];
- The participant in the experiment should be aware of the EMG examination procedure (in order not to be afraid in terms of experiment and to be relaxed);
- The sensors must be placed on skin that have removed hair growth (in order to eliminate disturbances related to the contact between the sensor and the skin);
- The participant must be in a relaxed state [Nemes D., Gogulescu A., 2006], convenient, no forced attitude [T. Szilagyi, 2008];
- The participant should not talk or laugh during measurement [T. Szilagyi, 2008];
- During the experiment the participant must perform only the protocol required movements;
- It is recommended that the participant does not have visual access to the monitor when the recording is conducted;
- Metal objects must be removed from the examined upper limb (watch, bracelet);
- The modular extension should be fixed, if possible, when recording.
- The sensors must not be in contact with other parts of his body or with foreign objects (experimental equipment cables, furniture, sports equipment, and clothing).

The experimental protocol has been approved by the Ethical Committee and the participant gave their consent, prior to the deployment of the experiment.

We have established that the flexion-extension movements of the forearm must be examined during this experiment, because these are the most common movements in daily activities, in medical rehabilitation, in exercises for people with disabilities, and in training athletes.

Running the experiment:

- The procedure has been explained to the participant in the experiment, in order to better understand the requirements for the experiment;
- The sensors have been applied on the participant's upper limb (fig. 3);

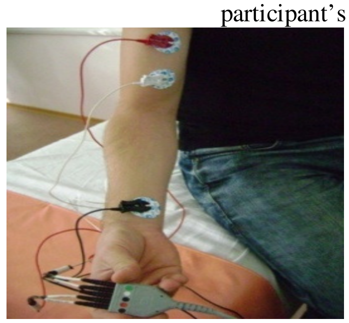

Fig.3. The placement of sensors

- The electrodes have been connected to the acquisition station;
- The AcqKnowledge program has been opened;
- The setup procedures require necessary adjustments in order to set up the data acquisition and the acquisition channels.

The channel settings allow the setting of acquisition channels and sampling frequency for each channel. The acquisition settings allow the setting of the storage mode, the saving mode, the storage location settings and the acquisition frequency and time (fig. 4).

Fig.4. Running the experiment

2. EXPERIMENTAL DATA

Three loading conditions have been established for conducting the experiment, as follows:

a. First situation: the movement is done without load; only the weight of the forearm and hand are opposed to the motion;

b. Second situation: the participant is holding a 2 Kg weight (only dumbbell bar);

c. Third situation: the participant is holding a 5 kg weight (fig. 4).

The time established for each load case was about 60 seconds, during which 18 repetitions of the movement were performed. We have been able to collect records of muscles activity for these three loading conditions (fig. 5, 6.7).

The red signal represents the unprocessed EMG signal and the blue one represents the processed signal. The processed signal is achieved by integration, which assumes eliminating first the noise.

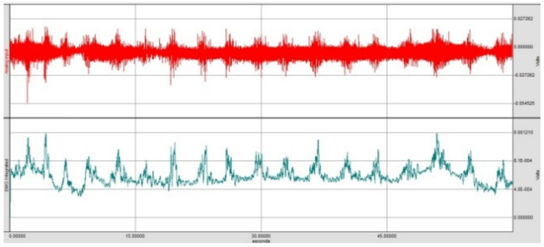

Fig.5. Loading stage 1

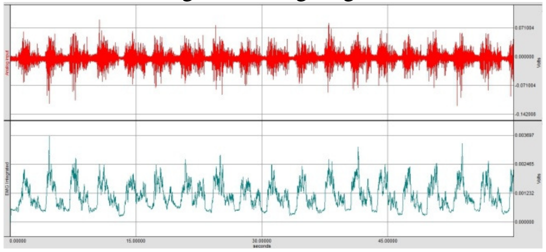

Fig.6. Loading stage 2

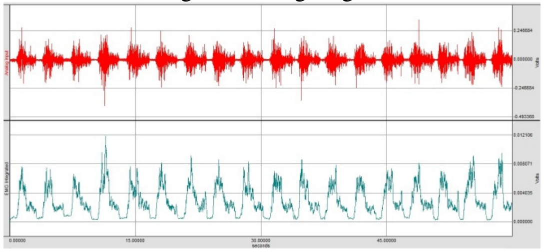

Fig.7. Loading stage 3

3. INTERPRETATION OF RESULTS

A muscle contraction is the result of the following phases (fig.8):

1. Inactivity phase - the muscle has no activity and is relaxed;
2. Loading phase – the muscle can perform the necessary work to defeat useful weight. During this phase the muscle performs an isotonic-concentric muscle contraction (contracture);
3. Maintenance phase – the muscle can perform the necessary work to maintain weight position. During this phase the muscle performs an isometric muscle contraction (contracture);

4. Primary discharge phase – the muscles performs an isotonic eccentric muscle contraction (contracture).

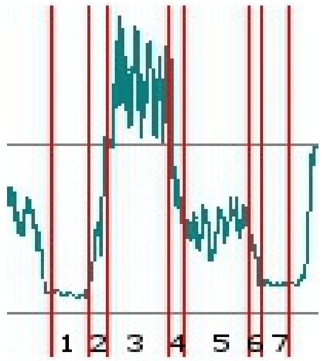

Fig.8. The muscles contraction phases

5. Motion stabilization phase - in this phase the muscle performs supplementary work (compared to the effort during the primary discharge phase) to provide precision to the movement. Although this phase presents a constant step on the discharge stage, however due to the elastic properties of muscles and tendons, mechanically speaking, we don't have take into account a shock. The muscle activity is isometric, visually indistinguishable (also due to muscle elasticity);
6. Secondary discharge phase – the muscle performs an isotonic, eccentric muscle contraction (contracture);
7. Phase of inactivity – the muscle relaxes after the exercise.

CONCLUSIONS

The third stage of experimental loading provides a better delineation of the muscle contraction phases, due to the fact that the muscle load is applied in dynamic terms. When performing research, identification of periods where the muscle is active can allow for correlation between external factors and muscle activity. Statistical methods might help us identifying the muscles activity.

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A MODEL FOR STUDYING THE HUMAN UPPER LIMB KINEMATICS

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Abstract

The paper presents a virtual model for studying the kinematics of the upper limb. The model was designed using Catia features, that provide also a kinematic module, tailor made for kinematic analysis. The displacement of the upper limb muscles, their velocities and accelerations are determined using that module. We were also able to input the motion law and to study two different motion, that are part of the daily activities or that are used in training.

Key-words: *biomechanics, upper limb, model, kinematics, muscles*