BIOMECHANICAL ANALYSIS OF SELECTED UPPER LIMB MANIPULATIONS OF PATIENTS AFTER STROKE

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Introduction

The upper limb is a part of the human body which allows gripping and performing very complicated manipulation. However, able-bodied limbs provide full independence in daily activities. So even simple tasks like eating or drinking, with the reduced manipulative skills, are a real challenge, and are often impossible to do. This implies such a strong interest in methods of treatment and rehabilitation and monitoring of its progress of people with motor dysfunctions of upper limb [Guzik, 2006, McClure, 2004]. The main aim of this work was to elaborate a methodology of experimental research in order to carry out biomechanical analysis of selected daily activities of upper limb.

Methods

Biomechanics analysis of selected daily activities consist of analysis of kinematic data and analysis of hand grip force and thumb grip force. In the frame of this work experimental research were carried, which involved patients (9 men) after a stroke. Selected daily activities such as drinking (CD), lifting a bottle of water of the specified height (BOS/BFS), screwing and unscrewing a bulb (SB/UB)and others. The MVN Biomech system was used for kinematic research. For measurement of hand grip force and thumb grip force special dynamometers were used.

Figure 1: Research in the MVN Biomech system

Experimental research was done twice in an interval of three weeks. Both in the case of registration of kinematics data and measurement of hand and thumb forces grip, both healthy and paretic limb were examined. Three measurements were made for each patient, then the results were averaged.

Results

The results of kinematic analysis supplied information to define the range of motion of upper limb in the shoulder and in the elbow joint (in flexion/extension motion). Values of maximal hand and thumb grip forces were determined for individual patients as well. For each patient detailed analysis was done during the first and the second examination. In this abstract exemplary results obtained for one of the patient are presented

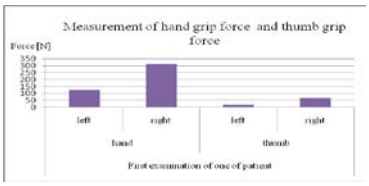

Figure 2: Values of maximum hand grip forces and thumb grip forces of one of patients (L – paretic limb, R – healthy limb)

The obtained results will be related to the elaborated standard based on research provided into healthy people.

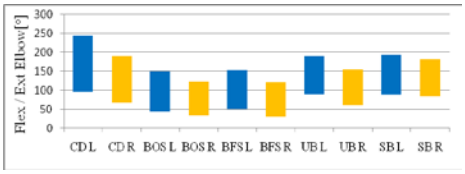

Figure 3: Range of motion in the elbow joint of upper limb of one of patients (L – paretic limb, R – healthy limb)

Discusion

Measurement of the hand grip force for a healthy limb is five times greater than for the paretic limb. For measurement of the thumb grip force the difference is five times. For a paretic limb an increased range of motion in the more healthy joint of that limb was observed. It is the result of action by the patient who tries to replace the paretic joint motion by movement of the adjoining joints. The intensity and the variety of this effect depends on the exercise performed.

References

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Acknowledgements

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