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A Comparative study about the Influence of Vibration on Elbow Joint Mobility

The results shown in [1] have referred to a particular appreciation of the elbow joint mobility of a subject to the action vibrations produced by a fitness device. Experiments - performed on four subjects - were held at the Institute of Research - Development - Innovation of the University "Transilvania" of Brasov and focused on the effects of vibrations on the joint mobility. This article represents a complement to the paper [1].

Keywords*: mobility, elbow joint, vibrations*.

1. Introduction

In my dissertation I designed and developed a numerical analysis system, for assessing the influence of vibration on the osteoarticular system (fingers, hands, elbows, knees), using virtual instrumentation MediTouch.

As shown in the previous article, in the study of effects of vibrations on the elbow joint mobility, I used an analysis equipment manufactured by MediTouch, which consists of an ergonomic elbow brace (ArmTutor), assisted by a specialized software.

Vibrations were induced by a fitness machine, inSPORTline type, model Rose 132. Reference sets of measurements were made before and after exposure to vibration [1].

To study the elbow joint mobility, experiments were performed on four subjects:

Subject A - male, 16 years old, left-handed;
Subject B - male, 43 years old, right-handed;
Subject C - male, 12 years old, right-handed;
Subject D - female, 39 years old, right-handed. [1], [2]

Figure 1. The four subjects during testing

2. Analysis

Subjects A, B, C and D were exposed to vibration "standing" on the vibrating plate. Subjects wore shoes as follows: Subjects B and D - Vibram soled shoes mountain and subjects A and C - sports shoes. Programs used and exposure intervals are shown in Tables 1 to 4:

Table 1. Subject A [1], [2]

Program	Stage	Frequency [Hz]	Time [min]	Total time [min]
P_1	2	3,92	2	3
	4	4,40	1	

Table 2. Subject B [1], [2]

Program	Stage	Frequency [Hz]	Time [min]	Total time [min]
P_1	2	3,92	2	9
	4	4,40	2	
	6	4,87	2	
	8	5,23	2	
	10	5,72	1	

Table 3. Subject C [1], [2]

Program	Stage	Frequency [Hz]	Time [min]	Total time [min]
P_1	2	3,92	2	3
	4	4,40	1	

Table 4. Subject D [1], [2]

Program	Stage	Frequency [Hz]	Time [min]	Total time [min]
P_1	2	3,92	2	6
	4	4,40	2	
	6	4,87	2	

For the forearms, the movement [deg], the movement frequency [cyc/sec], the maximum displacement - Max. ROM and maximum frequency of movement - Max. Freq. Energy were recorded.

3. Conclusion

For the elbow joints (Tables 5 to 8), subjects A and D have registered improvements of the joints mobility relative to subjects B and C, which have registered, in general, decreases of the movement frequency, caused by the exercise fatigue (with aninsignificant increase for the movement frequency in the left forearm of the subject B). There are 2 values outside the pattern: 104^0 (right forearm, subject A) and 101^0 (right forearm, subject D). The values of Max. ROM reveal less control over the movement of those forearms. [3]

Table 5. Subject A [1], [3]

Elbow	Before vibrations				After vibrations			
	Max. Freq. Energy [Hz]		Max. ROM [deg]		Max. Freq. Energy [Hz]		Max. ROM [deg]	
	0,86	1,16	95	65	1,03	1,46	104	58
	Right forearm	Left forearm	Right forearm	Left forearm	Right forearm	Left forearm	Right forearm	Left forearm

Table 6. Subject B [3]

Elbow	Before vibrations				After vibrations			
	Max. Freq. Energy [Hz]		Max. ROM [deg]		Max. Freq. Energy [Hz]		Max. ROM [deg]	
	0,96	1,00	81	57	0,80	1,03	67	47
	Right forearm	Left forearm	Right forearm	Left forearm	Right forearm	Left forearm	Right forearm	Left fore-arm

Table 7. Subject C [3]

Elbow	Before vibrations				After vibrations			
	Max. Freq. Energy [Hz]		Max. ROM [deg]		Max. Freq. Energy [Hz]		Max. ROM [deg]	
	0,90	0,93	92	80	0,86	0,9	57	76
	Right forearm	Left forearm	Right forearm	Left forearm	Right forearm	Left forearm	Right forearm	Left forearm

Table 8. Subiect D [3]

Elbow	Before vibrations				After vibrations			
	Max. Freq. Energy [Hz]		Max. ROM [deg]		Max. Freq. Energy [Hz]		Max. ROM [deg]	
	0,83	1,03	101	61	0,90	1,33	77	55
	Right forearm	Left forearm	Right forearm	Left forearm	Right forearm	Left forearm	Right forearm	Left forearm

For the future, I proposed virtual simulations using Simulink software.

References

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