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BIOMECHANICAL PROFILE OF THE MUSCLE PERFORMANCE, FLEXIBILITY AND POSTURAL BALANCE IN CAPOEIRA PRACTITIONERS

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SUMMARY

Objective: To evaluate the biomechanical profile of the muscle performance, flexibility and plantar pressure in capoeira practitioners. **Methods:** We analyzed 51 subjects that were divided into Capoeira Group (CPG) and Control Group (COG) (mean±standard deviation for CPG: 26.6±5.5 years old, weight 78.2±5.70kg and height 1.7±0.06m). Players were evaluated with a sit and reach test, baropodometry (DIASU[®]) and an isokinetic dynamometer (Biodex[®]). **Results:** We found a significant difference in flexibility (CPG: 35.8±8.7cm and COG 20.6±9.3cm, $P=0.01^*$). We observed that be capoeira practitioner is highly associated with greater flexibility (Chi-Square test of 23.29, $P=0.01^*$). Mean load on the dominant and non-dominant forefeet were 16.5±6.3kg (CPG) and 14.6±5.7kg (COG), $P=0.26$; and 10.8±6.3kg (CPG) and 15.4±5.5kg (COG), $P=0.01^*$; respectively. Mean load on the dominant and non-dominant rearfeet were 38.2±7.4kg (CPG) and 34.7±7.4kg (COG), $P=0.09$; and 34.3±6.7kg (CPG) and 35.8±9.6kg (COG), $P=0.51$; respectively. The total load on the dominant and non-dominant feet were 54.8±6.9% (CPG) and 49.3±8.1% (COG), $P=0.01^*$; and 45.1±6.9% (CPG) and 50.7±8.1% (COG), $P=0.01^*$; respectively. There were significant differences in peak torque at 60°/s for quadriceps muscle and H:Q ratio (Table 1). **Conclusion:** Capoeira practitioners were more flexible than the control subjects, and there was a tendency to asymmetry in the distribution of plantar pressure. Capoeira practitioners were stronger for quadriceps muscle, however have presented a worse H:Q ratio.

Keywords: biomechanical profile; Capoeira; Sports Physical Therapy.

INTRODUCTION

Capoeira is a Brazilian sport that combines fighting and dancing. Despite of be an important element of Brazilian culture, there is few available studies, particularly addressing the issues related to postural balance, flexibility and muscle performance. This study aimed to evaluate the biomechanical profile of muscle performance, flexibility and plantar pressure in capoeira practitioners

METHODS

It was conducted a study in Movement Analysis Laboratory of Federal University of Ceara, Brazil. This study was approved by the Ethical Committee at Federal University of Ceara. All of the participants provided written informed consent. We analyzed 51 subjects that were divided into Capoeira Group (CPG) and Control Group (COG). Players were evaluated with a sit and reach test, baropodometry (DIASU[®]) and an isokinetic dynamometer (Biodex[®]).

Participants answered an anamnesis questionnaire before starting the tests. The sit and reach test was performed to evaluate the flexibility of the posterior chain of the lower limb. Participants sat on the floor with their legs fully extended, then slowly bent forward and reaches along the top of the ruler, holding the stretch for three seconds, each subject repeated the test three times [1]. Second test was conducted in electronic baropodometer (DIASU[®]) and aimed to evaluate the distribution of plantar pressure in the standing position. Participants were positioned with their arms parallel to the longitudinal axis of the body and instructed to keep their eyes open and fixed on a point on a white wall 1 meter from the equipment [2].

The last test was conducted in an isokinetic dynamometer (Biodex[®]) and aimed to evaluate the muscle strength. Each subject was seated on the chair and assumed his most comfortable position. The subject was secured with snug straps across the shoulder, chest and hip. The rotational axis of the knee joint was aligned with the dynamometer rotational axis. We used the test protocol with concentric contractions for extension and flexion knee at 60°/s [3].

We used a *t*-student test and Pearson Chi-Square test. Data were analyzed with SPSS 17.0 and all statistical analysis was performed adopting a significance level of 5% ($p < 0.05$)

RESULTS AND DISCUSSION

It was analyzed 51 subjects (mean±standard deviation for CPG: 26.6±5.5 years old, weight 78.2±5.70 kg and height 1.7±0.06 m, BMI 26.0±2.8; and for COG: 24.4±5.8

years old, weight 75.4±10.0 kg, 1.70±0.07 m, BMI 23.7±5.7). There were no significant differences between groups regarding to characterization of sample ($P>0.05$).

We found a significant difference in flexibility (CPG: 35.8±8.7 cm and COG 20.6±9.3 cm, $P=0.01^*$). We observed that be capoeira practitioner is highly associated with greater flexibility (Pearson Chi-Square test of 23.29, $P=0.01^*$).

Regarding the distribution of plantar pressure can be seen in Figure 1.

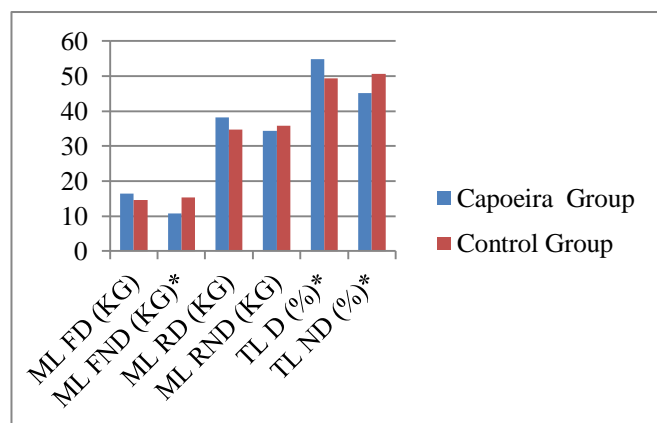


Figure 1: Distribution of plantar pressure.

† ML: Mean Load; FD: Forefeet Dominant; FND: Forefeet Non-Dominant; RD: Rearfeet Dominant; RND: Rearfeet Non-Dominant; TL= Total Load.

* Significant difference between the groups.

There were significant differences in peak torque at 60°/s for quadriceps muscle and hamstring/quadriceps strength ratio (Table1).

CONCLUSIONS

Capoeira practitioners were more flexible than the control subjects, and there was a tendency to asymmetry in the distribution of plantar pressure. Capoeira practitioners were stronger for quadriceps muscle, however have presented a worse H:Q ratio.

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Table 1. Mean and standard deviation for isokinetic measures.

Speed of test at 60°/s	Capoeira Group	Control Group	P
PT DQM (N.m)	218.0±33.7	198,8±27,3	0,02*
PT NDQM (N.m)	220.7±38.6	179,4±40,7	0,01*
PT DHM (N.m)	98.5±17.9	98,0±18,5	0,91
PT NDHM (N.m)	96.1±22.2	92,5±13,1	0,49
H:Q ratio D (%)	45.5±6.3	49,4±7,2	0,04*
H:Q ratio ND (%)	43.5±6.6	54,3±16,4	0,01*

† PT: Peak Torque; DQM: Dominant Quadriceps Muscle; NDQM: Non-Dominant Quadriceps Muscle; DHM: Dominant Hamstring Muscle; NDHM: Non-Dominant Hamstring Muscle; H:Q ratio: Hamstring/Quadriceps strength ratio.

* Significant difference between the groups.