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BIOMECHANICAL PROFILE OF THE BALANCE AND MUSCLE PERFORMANCE IN RUGBY ATHLETES

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SUMMARY

Background: This study aimed to identify the biomechanical profile of balance and muscle performance in rugby athletes. **Methods:** We analyzed nine athletes from a rugby club that participates in a regional championship (mean±standard deviation: 25.11±3.10 years old, BMI of 29.38±4.94, flexibility of 25.92±5.44 cm and experience time of 28.22±7.03 months). All athletes presented right-leg dominance. Each player was evaluated with an isokinetic dynamometer (Biodex®), an eletronic baropodometer (DIASU®) and a sit and reach test. **Results:** Peak torque at 60º/s for dominant quadriceps muscle was of 275.6±57.5 N.m and 273.5±47.9 N.m for non-dominant. Peak torque at 60º/s for dominant hamstring muscle was of 142.7±43.8 N.m and 129.8±60.8 N.m for non-dominant. Hamstring/Quadriceps strength ratio at 60º/s was of 52.9±18.5% for dominant limb and 46.7±16.3% for non-dominant limb. We found a significant difference in total load of plantar pressure (Table 1). **Conclusion:** Rugby athletes presented an asymmetry in balance and a symmetric pattern in muscle performance between dominant and non-dominant limbs.

Keywords: biomechanical profile; Rugby; Sports Physical Therapy.

INTRODUCTION

Rugby is a tackling sport that was originated in England and can be played in several modalities, which vary between junior, amateur, semi-professional and professional categories. The field is similar to the one from soccer, the aim is to pass the ball, which may either be carried by hand or kicked. This study aimed to identify the biomechanical profile of balance and muscle performance in rugby athletes.

METHODS

It was conducted a study in the Movement Analysis Laboratory of the Federal University of Ceara, Brazil. We analyzed nine athletes from a rugby club that participates in a regional championship. Each player performed tests in the isokinetic dynamometer (Biodex®) and electronic baropodometer (DIASU®), as well as a sit and reach test.

All participants answered a questionnaire before beginning the tests. The sit and reach test was conducted to evaluate lower limbs flexibility. Players were asked to sit on the floor, with knees in full extension, and then lean forward in order to reach the superior part of a ruler, holding this position for three seconds. Each athlete repeated this test three times [2].

The second test was performed in an electronic baropodometer, where plantar pressure and stabilometric indices were collected. Players were positioned with arms parallel to the longitudinal axis of the body and instructed to keep eyes opened and looking directly into a dot located one meter away from the front wall [3].

The last test was performed in the isokinetic dynamometer and aimed to evaluate muscle performance. Each player was asked to sit on the chair and stay in the most comfortable position as possible. Shoulders, thorax and hips were stabilized. The rotation axis of the knee

joint was aligned with the rotation axis of the dynamometer. We used a protocol with concentric contractions for extension and flexion knee at 60º/s [4].

We used SPSS 17.0 to analyze all data and a *t*-Student test to determine differences between the legs with a 5% level of significance.

RESULTS AND DISCUSSION

Athletes had a mean age of 25.11±3.10 years, mean weight of 90.55±19.02 kg, mean height of 1.75±0.06 m, BMI of 29.38±4.94 kg/m², flexibility of 25.92±5.44 cm and experience time of 28.22±7.03 months). According to other studies, flexibility < 24 cm is considered bad in male individuals with age between 20 and 24 years and below average in those with age between 25 and 29 years [5].

Extension peak torque was 275.6±57.5 N.m in the dominant limb and 273.5±47.9 N.m in the non-dominant limb. Flexion peak torque was 142.7±43.8 N.m and 129.8±60.8 N.m in the dominant and non-dominant limbs, respectively. Literature determines that a difference between legs of until 15% is considered to be normal [6].

Agonist/antagonist ratio was 52.9±18.5% in the dominant limb and 46.7±16.3% in the non-dominant limb. Authors have indicated that the ideal hamstring/quadriceps ratio at 60º/s is around 60%. Therefore, alterations in this relation may be considered as a risk factor for injuries [7].

Results of the baropodometer tests are available in table 1. We found a significant difference between total loads. In stabilometry, ellipse area of bipedal test was of 164.6±148.9 mm².

CONCLUSIONS

Rugby athletes presented an asymmetry in balance and a symmetric pattern in muscle performance between dominant and non-dominant limbs.

REFERENCES

1. Alves LM, et al. *Fisioterapia e Pesquisa*. **15**:131-135, 2008.
2. Rosa AS, et al. *Terapia Manual*. **4**:97-107, 2006.
3. Bankoff ADP, et al. *Revista Conexões*.**4**:11-18, 2006.
4. Terreri A, et al. *Revista Brasileira de Medicina do Esporte*. **7**:170-174, 2001.
5. Ribeiro, CC. *Rev Bras Cineantropom Desempenho Hum*. **12**:415-421, 2010.
6. PREIS, C, et al. *Revista FisioBrasil*. **10**:7-10, 2006.
7. Sapega AA. J Bone Joint Surg Am. **72**: 1562-1574, 1990.

Table 1. Mean and standard deviation of the baropodometer indices.

	Dominant Limb	Non-dominant Limb	*P*
Forefoot Load (kg)	20.5±2.5	21.1±1.4	0.51
Rearfoot Load (kg)	27.6±3.9	31.1±5.0	0.18
Total Load (%)	43.8±8.2	31.1±5.0	0.02*
Ellipse Area (mm²)	158.5±110.8	213.7±190.7	0.40
Medial/Lateral Sway (mm)	0.22±0.09	0.26±0.12	0.33
Anterior/Posterior Sway (mm)	0,28±0,10	0,32±0,14	0.33

* Significant difference ($p<0.05$).