

# Isokinetic Analysis in Professional Football Players

## Research Article

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## Abstract

**Objective:** To verify at preseason the isokinetic analysis in professional field soccer athletes.

**Methods:** We prospective evaluated isokinetic analysis tests in 30 professional athletes aged between 18 and 35 years in the Portuguese Association of Sports in the preseason for evaluation of knee flexors and extensors at speeds of 60 degrees per second and 300 degrees per second. Descriptive Statistics were used to describe the sample data and t-Test for comparisons of test results with BioEstat 5.3 software.

**Results:** The peak torque adjusted for body mass at speeds of 60°/sec and 300°/sec was higher in the knee flexors on the dominant side of the athletes.

**Conclusion:** The knee flexors on the dominant side were stronger in relation to the non-dominant side in the two velocities studied.

**Keywords:** Soccer; Isokinetic; Knee

## Introduction

Soccer is considered the most popular sport in the world, with around 270 million people participating in its numerous competitions. At the professional level, there is an increasing number of games and competitions in the season, making the sport faster and with a high physical performance demanding on the lower limbs, which are the most requested muscles to execute many actions such as kicks, jumps, and sprints [1-3].

The isokinetic evaluation aims to identify muscular imbalances that can lead to an injury or interfere in the return to sports activities. This evaluation also generates isolated parameters such as strength, power, and resistance. These parameters are important to evaluate muscular performance and post-injury recovery. The evaluation can be performed on the hip, knee, wrist, elbow, ankle, and shoulder joints, being evaluated at a fixed speed and an adaptive resistance. This is the only way to dynamically overload the muscle to its maximum capacity. The evaluation in preseasons allows to verify imbalance of strength on musculature, thus reducing the incidence of lesion [2-6].

The knee joint is well studied by the isokinetic tests, which evaluates the athletes' muscular performance in normal and post-affectation conditions as well as muscular imbalances related to the agonist/antagonist, i.e. knee flexors/extensors, represented respectively by the hamstrings and quadriceps. These muscle groups are of great importance in the functionality of the match and execution of movements stabilizing the knee in the required situations [2-5].

High-performance sport emphasizes physical training and the athlete is constantly being charged for a better performance in their daily training and competition activities. The muscular imbalance of the ischiotibial/quadriceps muscles can generate incorrect

postures, repetitive movements, and early fatigue, favoring the appearance of muscle-tendon injuries. In consequence, the performance of the athlete may be compromised. Therefore, information regarding muscular imbalance is of great importance [3-4].

There are some contraindications for its accomplishment, painful attacks with or without an evident clinical inflammatory process, insufficient time for a tissue repair process and decompensations of the cardiorespiratory system, such as uncontrolled arterial hypertension [2]. The objective of this study was to verify the isokinetic analysis in professional field soccer athletes at preseason.

## Methods

This is a descriptive (documentary analysis), prospective study of approved by the Ethics and Research Committee of the Paulista-UNIP University under the number 1.274.420. After approval, information was collected on reports of isokinetic tests performed with professional soccer players aged between 18 and 35 years in the Portuguese Sports Association, located in the city of São Paulo. All data were collected in 2015 at the preseason between January and February. The tests were applied through the isokinetic dynamometer (Biodex®) System 3 model. Prior to the test, all athletes performed 5-minutes warm-up on an ergometer bike. After that, all participants performed 5 repetitions in both legs at 300 degrees per second (resistance exercise), and 5 repetitions in both legs at 60 degrees per second (strength speed).

## Statistical Analysis

Descriptive statistics was used to obtain the mean and standard deviation of the anthropometric data. The Kolmogorov-Smirnov test was used to verify the normality of the data. T-Test was used

for related samples in the comparisons between the dominant and non-dominant sides. Data were analyzed using BioEstat 5.0 software.

## Results

We analyzed 30 medical records of professional athletes aged between 18 and 35 years. The personal and anthropometric data of the sample studied are shown in (Table 1). Regarding dominance (kicking leg), 22 subjects were right-handed (73.3%) and 8 left-handed (26.7%). In relation to the number of athletes divided by field position in the charts analyzed, a greater number of goalkeepers and wide midfielders followed by defenders were observed. In the analyzed variables of the isokinetic tests, the peak torque adjusted for body mass at velocities of 60°/sec and 300°/sec was higher in the knee flexors of the dominant side of

the athletes. (Table 2) Comparison of peak torque values adjusted for body mass (PT/BW) and total work (TW) of knee flexors and extensors.

**Table 1:** Personal and anthropometric data of the sample.

	Athletes (n=30)	
	Mean	SD
Age (years)	25.2	5.3
Weight (Kg)	79.8	8.23
Height (m)	1.82	0.08
BMI (kg/m <sup>2</sup> )	23.9	1.5

**Table 2:** PT/BW- pico de torque ajustado pela massa corporal; TT- trabalho total

Velocity	Muscle Group	Variables	Dominant Side	Non-Dominant Side	P-Value
60°/s	Flexors	PT/BW (%)	204.83(31.30)	194.12(31.93)	0.01
		TW (J)	708.25(183.58)	679.14(173.01)	0.09
60°/s	Extensors	PT/BW (%)	319.40(50.38)	326.91(50.03)	0.4
		TW (J)	898.92(190.42)	914.21(197.16)	0.56
300°/s	Flexors	PT/BW (%)	127.79(20.39)	120.92(18.62)	0.05
		TW(J)	417.86(93.33)	395.94(91.25)	0.09
300°/s	Extensors	PT/BW (%)	172.34(27.55)	174.79(27.17)	0.56
		TW (J)	483.63(105.49)	495.84(107.65)	0.4

## Discussion

The objective of this study was to verify the results of isokinetic tests in professional soccer athletes at the preseason using muscle strength of knee extensors and flexors of the dominant and non-dominant side. The isokinetic evaluation performed with field soccer players is of great importance, making a great contribution to the health of the athlete. Moreover, the athlete should perform periodic assessments, mainly in the knee joint due to important functions in specific movements performed during training and matches [3,5,8-9,16].

There are different angular velocities to be adjusted in the isokinetic dynamometer: slow, intermediate, and fast according to the purpose of the study. Several studies show that the highest value for torque occurs at a lower speed (60°/s). In the present study, the evaluations were also performed at this speed, but other speeds were used in different studies, which makes it difficult to compare them [1,2,6,9,14,17].

The imbalance of the flexor and extensor knee muscles in professional athletes is commonly observed and it is detrimental to the knee joints. Therefore, the balance between the dominant and non-dominant limb muscles is crucial for injury prevention, being the peak torque the best parameter for comparison of this musculature. In this study, the peak torque adjusted by body mass was evaluated. In contrast, several studies only sought to analyze the dominant and non-dominant sides, but without assessment of peak torque adjusted by body mass. In fact, only one study took this into consideration [14]. This variable is of great importance

during the evaluation since the athletes present different body weight and height. Consequently, the results adjusted by the body mass are more accurate and safer [2,3,8-9,13,16,17].

Several studies showed different results of fatigue and strength deficits on the dominant and non-dominant side of the athlete, often depending on the position where the athlete plays. In this study, the positions of the athletes were also identified. We observed that the dominant side showed to be more affected, since it is more required in field soccer at the time of kicking, passing, sprinting, long distance kicks, vertical jump, among other movements. Therefore, the moment of the season in which they were evaluated must be considered [3,5,12,13,15-17].

In this study, the analyzed variables of the isokinetic test showed that the peak torque adjusted by body mass at velocities of 60°/sec and 300°/sec was higher in the knee flexors of the dominant side of the athletes suggesting asymmetry in muscle strength and endurance between the dominant and non-dominant knee flexors. Total work was also evaluated, where the sum of the repetitions that the athlete performed during the test occurred, and no significant differences were found [12,14].

Previous studies did not show the period in which the isokinetic tests were performed in the athletes. In this study, we included the tests performed at the preseason, which we consider a good moment to evaluate soccer players, since it allows the identification of the deficits and preventive interventions before the competitions. This study showed that the dominant muscle strength was greater in the knee flexor group, suggesting that

the strength training applied to the athletes may be emphasized the knee extensors group. Based on the results obtained in the preseason evaluations, it is possible to individualize the training sessions with specific exercises, so that during the year of competition the deficits can be prevented due to muscular asymmetry [1-17].

## Conclusion

The knee flexors on the dominant side were stronger compared with the non-dominant side in the two velocities studied. Knee extensors showed similar strength at both speeds.

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## Conflicts of Interest

Authors declare there is no conflict of interest in composing this manuscript.

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