ANTHROPOMETRIC AND PHYSIOLOGICAL PROFILE OF PORTUGUESE RUGBY PLAYERS - PART II: COMPARISON BETWEEN ATHLETES WITH DIFFERENT COMPETITIVE LEVELS

EXERCISE AND SPORTS MEDICINE CLINIC

ORIGINAL ARTICLE

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ABSTRACT

Introduction: Since it became professional in 1995, several studies have reported greater differentiation of athletes at all levels for each position. However, despite being common in countries where rugby is more popular, no studies seeking to investigate the anthropometric and physiological characteristics of Portuguese rugby players have been published yet. We sought to evaluate the physiological and anthropometric characteristics of the Portuguese rugby athletes playing in different competitive levels by studying the following variables: age, body mass, stature, body composition, maximal aerobic capacity, acceleration, speed and agility. Objectives: To anthropometrically and physiologically characterize Portuguese rugby players, attempting to identify any differences between athletes of different competitive levels and to compare the recorded results with similar studies. Methods: We assessed 46 rugby players from two teams competing in different divisions of the men senior national championships. Out of the 46 athletes evaluated, 24 belonged to a semiprofessional team and 22 to an amateur team. The 46 athletes underwent anthropometric assessment, where stature, body mass and skin folds were determined. Out of these, 40 also underwent physical capabilities assessment which consisted in determining speed and acceleration capability, through 30 and 10 meter- running tests, respectively. Additionally, their maximum aerobic capacity was determined through the Luc Léger field test. Statistical analysis was performed using the IBM® SPSS® Statistics v.19 and a significance level of 5% was considered. Results: It was found that semiprofessionals were on average 3cm taller than backs and presented average body fat percentage of only 15.09% (+/-6.03) compared to the 22.39% (+/-6.54) of backs. Amateurs were also four years older and presented higher average Body Mass Index than semiprofessionals. Concerning the physical tests, results were similar between groups. Discussion and Conclusions: In the present study, the expected differences between athletes from different competitive levels were not identified. In fact, regarding body composition and height, we have found an advantage of the semiprofessional athletes. However, the homogeneity observed seems to indicate that Portuguese rugby has not given the qualitative leap yet that professionalism brought up to the countries with greater tradition in this sport.

Keywords: football, anthropometry, physiology.

INTRODUCTION

In 1995, the *International Rugby Board*, maximum organ of the *rugby union*, decided to free the introduction of professionalism of its athletes[1]. Since then, and considering the increasing attention of the media and the investment which started to be made in the modality, greater interest for the scientific approach of the sport and the athletes has appeared, in an attempt to understand which demands of the game and the characteristics of the players associated with better performance, in order to reach training and results maximization[2,3]. Considering this new variable, many studies tried to compare from the point of view anthropometric and physiological, the athletes of different competitive levels, to evaluate the impact of professionalism in the modality[1].

In the last 15 years increase in body mass and height of the athletes (both forwards and backs of higher competitive level) has been observed[4]. In *rugby*, higher body mass is related to higher capacity to produce strength, performance in melée", "rucks" and "mauls"[5] and more competitive success [1,6]. However, when increase in body mass occurs more due to fat mass than muscular mass, the body

mass-power ratio is reduced, the energy spent during the movement increases and vertical and horizontal acceleration decrease[7]. Greater mobility of the athletes verified in the last years has been aassociated with higher levels of muscular mass and lower fat mass percentage[1,6,8,9]. Increase in professionalism in physical preparation of athletes is probably the main cause for this significant increase in body mass of athletes, especially in the elite forwards[1,6]. Likewise, the majority of the studies seem to be unanimous in pointing out that the higher the competitive level, the taller the athletes will be[1,10].

General consensus points to body fat percentage of the athletes decreasing with the increase in the competitive level[8,11]. These differences seem to reflect on higher training load and diet practice more favorable among elite players[1,9] Concerning the tests for determination of maximum aerobic capacity, velocity, acceleration and linear moment, statistically significant differences were equally observed among athletes of different competitive levels, with advantage to the higher level ones[10,12].

IN Portugal, in 2010/11, the competitive scenario of rugby senior men was divided in three levels. The main one, called National Championship of the Honor League, is a semiprofissional competition and played by eight teams. The second level, the National Championship of the First League, is played by seven teams, in the same format that the Honor League, promotes the championship for the first level and passes down the last to the National Championship of the Second League (third and last level)[13].

Thus, it was relevant to perform this first study to evaluate whether the Portuguese athletes of different competitive levels also present the same anthropometric and physiological differences observed in the studies already published with athletes from other countries. Therefore, we will be able to infer in Portugal the introduction of the professionalism in training and preparation of rugby athletes is already a reality or if it is still a goal to be reached.

OBJECTIVES

To characterize from the anthropometric (weight, height, skinfolds and fat mass percentage), as well as physiologically (acceleration, velocity, maximum aerobic capacity and linear moment) point of view, the Portuguese rugby athletes.

To compare the results obtained by the athletes of different competitive levels (amateur and semiprofissional), trying to identify occasional differences between these athletes, both anthropometrically and physiologically.

To compare the results obtained with the remaining papers already published.

METHODS

46 senior male athletes of two teams which play the Portuguese rugby championships of the XV of the Honour League (first competitive level) and the 2nd National League (third competitive level) were evaluated in this study. The athletes evaluated were grouped according to their competitive level in semiprofessional (n = 24) and amateur (n = 22). All the athletes were evaluated from the anthropometric point of view; however, since they were injured, six athletes from the first group did not perform the physical tests. Prior to the evaluations, data about age, number of training of field and in gymnasium of each athlete were collected. All the evaluations were performed between December 2010 and February 2011, following guidelines form the *American College of Sports Medicine* (ACSM)[14]. First, anthropometric evaluation of the athletes was performed in a room with controlled temperature. Subsequently, on turfed field, a set of physical tests was performed.

Anthropometric evaluation consisted in height[14,15], body mass [14,15] and nine skinfolds (bicipital, tricipital, subscapular, thorax, midaxillary, abdominal, suprailiac, thigh and twin)[14] determination of the athletes. Fat mass percentage of the athletes was estimated based on the formulas available by the ACSM[14]. Physiological evaluation consisted in determination of VO_{2max} by the Luc Léger test[16,17], acceleration and velocity, through performance of 10 and 30 m running tests, respectively[1].

Statistical analysis was performed with software *IBM® SPSS® Statistics v.19*. Distribution normality of the quantitative variables was assessed with resource of the Kolmogorov-Smirnov or Shapiro-Wilk tests. In descriptive analysis, mean and standard deviation for samples from normal distribution were determined, while for non-normal distribution the median and interquartile amplitude were determined. Concerning the inferential analysis, Student's *t* test was used for independent samples in the comparison of quantitative variables with normal distribution between two groups, while for non-normal distribution of variables; the corresponding non-parametric Mann-Whitney test was used. Significance value of 5% was considered.

RESULTS

The results obtained by the amateur and semiprofessional athletes are summarized in tables 1, 2 and 3.

Statistically significant differences between the number of training on field, training in gymnasium, fat mass percentage and age of the amateur and semiprofessional athletes was observed.

Thus, for the group of semiprofessional athletes, median of 3 (±1) weekly training in gymnasium was verified, while in the amateur group this value was of only 1 (±3). Concerning the number of training on field recorded, it was observed that all athletes of higher level completed the same number of sessions (three weekly training sessions), while the lower level athletes group, despite having median of three weekly training session as well, the interquartile amplitude was of 1 (table 1).

Regarding body composition, the semiprofessional athletes presented mean fat mass percentage of 15.09% (± 6.03) and sum of

Table 1. Data of the training of the evaluated athletes.

	Number (n)	Weeekly training in gymnasium (n)	Weekly training on field (n)
Semiprofessionals	24	3 ± 1	3
Amateurs	22	1 ± 3	3 ± 1
p		0.001*	0.003*

*p < 5%.

Table 2. Anthropometric characteristics of the evaluated athletes.

	Number (n)	Age (years)	Body mass (kg)	Height (m)	BMI (kg/m²)	Sum of nine skinfolds (mm)	Fat mass (%)
Semiprofessionals	24	23.5 ± 5	86.77 ± 13.60	1.78 ± 0.06	26.20 ± 4.50	129.88 ± 56.69	15.09 ± 6.03
Amateurs	22	27.5 ± 9	86.97 ± 15.82	1.75 ± 0.07	27.10 ± 5.15	189.09 ± 71.70	22.39 ± 6.54
p		0.003	0.962	0.089	0.272	0.000*	0.000*

*p < 5%.

Table 3. Physiological characteristics of the evaluated athletes.

	Number (n)	VO_2max (LO2/min)	VO_2max (mlO2/min/kg)	Acceleration (s)	Velocity (s)	Linear moment (kg.m/s)
Semiprofessionals	18	4.27 ± 0.59	50.10 ± 5.06	2.07 ± 0.26	4.66 ± 0.46	554.27 ± 78.51
Amateurs	22	4.15 ± 0.45	48.69 ± 7.02	2.01 ± 0.14	4.71 ± 0.34	552.98 ± 84.87
p		0.474	0.481	0.342	0.703	0.961

*p < 5%.

nine skinfolds of 129.88 mm (±56.69), while the amateur presented mean of fat mass of 22.39% (±6.54) and sum of nine skinfolds of 189.09 mm (±71.70) (table 2). Concerning age, it was observed that the amateur athletes were significantly older than the semiprofessional ones, with this difference being set at four years (table 2).

Although statistically significant difference has not been found, it was verified that the semiprofessional athletes were slightly taller (3 cm) and presented lower level of body mass index (BMI) (table 2).

No statistically significant difference was found in the physiological evaluation among the athletes of the different groups. However, it was possible to verify that the semiprofessional athletes presented better results in the velocity tests, higher linear moment and greater maximum aerobic capacity (table 3). Nevertheless, we recorded better performance of the amateur athletes in the acceleration tests.

DISCUSSION

Rugby is, as already seen, a sport under growing popularity in Portugal and around the world. This sport gets increasing attention from the media and public, which makes it more competitive and exciting for all of those involved in it. The anthropometric and physiological characterization of the rugby athlete which we tried to perform in this study was the first contribution to desirable greater involvement in the near future from the side of professionals and professors in the field.

Moreover, we tried to verify if the same differences between amateur and semiprofessional athletes found in the remaining similar studies published with populations from other countries existed in the Portuguese rugby.

It was verified that the semiprofessional athletes trained more times per week than the amateur ones, both in number of training on field and in gymnasium sessions. It is very probable that this is the reason why significant difference between the sum of the nine skinfolds and estimated fat mass percentage was found, with worse results for the amateur athletes.

When the results of the physical fitness evaluation tests were compared, no significant differences have been found between amateur and semiprofessional athletes. However, in the events for determination of the maximum aerobic capacity, velocity and calculation of the linear moment, the semiprofessional athletes had an advantage.

While the literature presents significant differences for almost all the evaluated parameters between the amateur and the high-level ones, in the present study it was not possible to confirm this correlation [1,4,6,8,10-12]. The groups of athletes of different competitive levels were very homogeneous both anthropometrical and physiologically, except for body composition.

This higher homogeneity leads us to believe that the Portuguese rugby has not taken the qualitative leap professionalism brought to countries with more tradition in this modality.

An important datum which will allow us believe that the mentality and work field is under construction in the studied population, is concerned about the found significant difference in the number of weekly training sessions in gymnasium both for forwards and backs of higher competitive category.

We believe that the work performed by coaches and athletes at this level may eventually allow that a study similar to the one performed now translate significant differences among amateur, professional or semiprofessional athletes in the near future.

The Portuguese athletes will have to practice more frequent number of times, increase their body mass and reduce their fat mass percentage. They will also have to be faster, agile and capable at the aerobic level, equally producing higher linear moment. Additionally, the technical and tactical aspects of the modality should not be neglected.

Speaking particularly of the group of forward athletes of the higher category, they should increase height and body mass, while decreasing their fat mass and improving their results in the physical tests. In the backs, the evolution should go through increase of their body mass and linear moment production, since no great differences with the remaining published studies have been found in the physical evaluation performed.

All authors have declared there is not any potential conflict of interests concerning this article.

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