Birlesik Dünya Arastırma
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Innovasyon ve Yayıncılık Merkezi

New Trends and Issues Proceedings on Humanities and Social Sciences

New Trends and Issues Proceedings on Humanities and Social Sciences

Volume 8, Issue 3 (2021) 37-43

www.prosoc.eu

Selected Paper of 13th World Conference on Educational Sciences (WCES-2021) 04-06 February 2021, University of Cadi Ayyad, Marrakech, Morocco

Explosive strength evolution of Romanian professional rugby players – Backs

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Suggested Citation:

Alexandru, O., Alexandru-Rares, P., Bogdan-Constantin, U., & Adrian, C. (2021). Explosive strength evolution of Romanian professional rugby players – Backs. *New Trends and Issues Proceedings on Humanities and Social Sciences. 8*(3), 37-43 https://doi.org/10.18844/prosoc.v8i2.6159

Received from March 12, 2021; revised from April 23, 2021; accepted from June 28,2021.
Selection and peer review under responsibility of Assoc. Prof. Dr. Jesus Garcia Laborda, University of Alcala, Spain.

Abstract

The purpose of this study is to highlight the evolution of the explosive strength in the 4-year interval of the backs compartment and the level of adaptation to the game requirements. The hypothesis in this study is that the explosive strength of the lower limbs in rugby backs developed during the past 4 years, trying to keep up with the higher needs in the first Romanian league. Explosive power was measured using the 'Just Jump System', which is a plyometric test mat on which the players conducted a set of three tests: squat jump, control movement jump and free jump. The forwards significantly improved their explosive strength in a 4-year period. Although the total body mass got bigger, the players managed to improve their lower limbs' explosive strength; this fact proves a good physical adaptation to the requirements of the rugby game.

Keywords: Power, jump.

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1. Introduction

In the recent period, rugby has evolved considerably worldwide and nationwide. The restructuring of the first Romanian rugby league and the flow of foreign players have generated a rapid increase in the training level of professional players. In order to maintain a high level of the rugby game, the players of the first Romanian league have to meet the technical, tactical and functional somatic requirements. By the nature of its complexity, rugby requires a high level of strength combined with a good speed so the player can break the opposite defensive line or generate a good intervention as a defender. For that the professional players have to adapt their training to these demands.

At the beginning of the third millennium, high sports performance can be achieved only through the application of multidisciplinary knowledge, from fields that have recently become complementary to performance sport: biological statistics, biomechanics, biophysics, biochemistry, nutrition and metabolism, psychology and various medical sciences. This is apparent mainly during the Summer Olympic Games, where medical specialists accompany sports delegations, as they are indispensable for monitoring the athletes throughout the competition.

The impact of medical studies in the practice of the rugby game became visible when this sport passed from the amateur to the professional level. In the last 20 years or so, the rugby game in general has evolved spectacularly. The players had to adjust to the new requirements of modern rugby. They had to improve mostly their motor qualities, both the basic and the specific ones. However, at the beginning of the 90s, the first row players had consistent body fat, nowadays a first row player must be athletic; a large body mass is ensured by a well-developed muscular tissue, doubled by mobility and speed of reaction. Research conducted on rugby players has shown that these morphological changes have improved both the exercise capacity of the athletes and the general state of the entire musculoskeletal system. Medical sciences have a very important role in the scientific organisation of exercise practice system. The specialists of both sport field and physical education, use – for the improvement of exercise – information regarding the anatomic functional processes during physical effort (Moraru et al., 2018).

In scientific literature, there are several studies (Duthie et al., 2006; Gabbett, 2005; Oprean, 2014; Pook, 2012) regarding the physical training level and the somatic profile of rugby players, mostly in the countries with tradition in this sport. In Romania, this topic has been approached increasingly in the recent years, considering the increased level of the first rugby league players. Similar studies were conducted on children and athletes with sports injuries as well (Ungurean & Popescu, 2017).

The topic of this study concerns the evolution of explosive strength in a 4-year interval. The study was conducted on the same team, and mostly on the same players. This study regards only the rugby backs, a category presented per positions, as follows:

- The backs category comprises seven players, who are as follows:
  - *halves* – made of one scrum-half and one fly-half;
  - *centres* – made of one inside centre and one outside centre;
  - *wings and fullback* – made of two wingers and one fullback.

We have chosen to study the compartments separately because they have different tasks and loads and this generates highly distinct physical capacities. This phenomenon also emerges for positions within the same category, but on a different scale.

2. The biological model of the *halves* and the 3/4 line

- Fly halves: height 183 cm ± 3 cm; weight 86 kg ± 4 kg; waist / weight ratio 4 kg over waist in cm – 100; body composition 89% active tissue and 11% adipose tissue. Being the key element in the team, the psychomotor qualities are dominant, having the best values in tests.
- Scrum halves: height 179 cm ± 5 cm; weight 86 kg ± 5 kg (7 kg over waist in cm – 100); body composition 89% active tissue and 11% adipose tissue; proportionality index below 2.
- Centres: height 185 cm ± 3 cm, weight 95, 7 kg ± 4 kg; (10 kg over the waist – 100); proportionality index up to 2; body composition 89% active tissue and 11% adipose tissue.
- Wings: height – 188.5 cm ± 5 cm; weight 96 kg ± 8 kg; proportionality index below 2; body composition 89% active tissue, 11% adipose tissue; the wings are the players with the most developed speed.
- Fullbacks: height 185 cm ± 4 cm; weight 93 kg ± 4 kg; body composition 89% active tissue and 11% adipose tissue (Gabbett, 2005).

For players in the 3/4 line, the energy needs are as follows: higher aerobic endurance than the forerunners, with very good values, anaerobic lactase and alactic capacity with good values, but lower than the forerunners (Gabbett, 2002). The main driving force of this group of players is the speed that must be excellent. Skill tests must have very good results, as well as very good strengths, but usually lower than those of advanced players. Neuromuscular testing requires very good values in the upper and lower limbs, psychomotor testing with very good values for quick analysis and decision, tactical intelligence, concentration and distributive attention, team spirit, fighting power and courage (Duthie et al., 2006).

The purpose of this study was to highlight the evolution of explosive strength during the last 4 years. This study is meant to complete previous studies conducted by the authors (Oprean, 2014). To conduct a good and specialised training programme one has to realise the level of adaptation imposed by the opposite teams.

With regard to the hypotheses in this study, we have started from the following premises:

- The explosive strength of the lower limbs in rugby backs developed during the past 4 years, trying to keep up with the higher needs in the first Romanian league.
- The explosive strength of the wings and fullbacks is better than the others, due to position tasks.

3. Material and methods

The study was conducted during the 2012–2013 pre-season periods and again during the 2016–2017 pre-season periods. The athletes within our research are part of the rugby team of ‘C.S. Politehnica Iasi’, activating in the first rugby league. Both times the test was conducted on 12 backs players. We mention that only four players were part of the team for the both sets of tests.

Explosive power was measured using the ‘Just Jump System’, which is a plyometric test mat on which the players conducted a set of three tests:

- Squat jump – the player starts the jump after a held squat position for 2 seconds and both hands are held on waist all this time. Height of it is measured in cm.
- Control movement jump – the player starts form a standing position, he makes a triple flexion and executes a jump in a continuous movement with both hands held on the waist.
- Free jump – executed in a continuous movement helped also by the movement of the arms.

4. Results and discussion

The research results were included in tables where we calculated arithmetic mean and standard deviation. Figure 1 shows the features of the results of explosive strength measurements for the 2012 players. The average age is 23, showing a proper age for backs players (Gabbett, 2002). The height results are under the limits generated by professional rugby players for all backs positions, especially for the halves (Dragan, 2002). The average total body mass of players is below the profile of backs. Regarding the jumping tests, we can observe a slight variation among the backs positions. The results are almost the same, an exception is made by the results in the wings and backs free jump.

Position	Age	Body mass	Height	Squat jump	Contral movement jump	Free jump
Halves	23	78	174	31	32	39
Centres	24	83	179	33	33	40
Wings and Fullbacks	22	79	179	32	33	43
Average	23	80	177	32	33	41
Std Dev.	1.0	2.6	2.9	1.0	0.6	2.1

Figure 1. 2012 backs results

Figure 2 shows the features of the results of explosive strength measurements for the 2016 players. The average age is 23, the same as the 2012 tested players (Gabbett, 2002). The height results are under the limits generated by professional rugby players, except the wings and fullbacks (Dragan, 2002). The average total body mass of players fits the profile for centres and wings. The halves present a lower body mass for this position. Regarding the jumping tests, the results vary different than the 2012 players. The best results are for the halves and centres, opposite to wings and fullbacks, who obtained poorer results.

Position	Age	Body mass	Height	Squat jump	Contral movement jump	Free jump
Halves	23	75	173	48	51	57
Centres	24	90	181	48	50	56
Wings and fullbacks	23	83	184	47	48	55
Average	23	83	179	48	50	56
Std Dev.	0.6	7.5	5.7	0.6	1.5	1.0

Figure 2. 2016 forwards results

In Figure 3, we see the comparison between the two groups of halves. Although the 2016 players present better morphological results, the age of the two groups are the same. The age results are in the limits of experienced professional rugby players. The age average of backs varies under the average of forwards, this being due to the fact that the two compartments have different tasks during the rugby match (Gabbett, 2002). The body mass and height vary abnormally, being lower for 2016 players. The height and body mass are below the professional players limits. A big body mass is not the main characteristically of this player, but the modern rugby game requires a higher volume of lean mass, so the players can cope with the higher body contacts.

The results of the explosive strength test are significant better for the 2016 players in all three tests. In all three tests, differences are higher than 10 cm. Also, the four players who were tested both times show a very good evolution over the 4-year period. The results of the 2016 players are situated within the limits for international professional players (Brannigan, 2016).

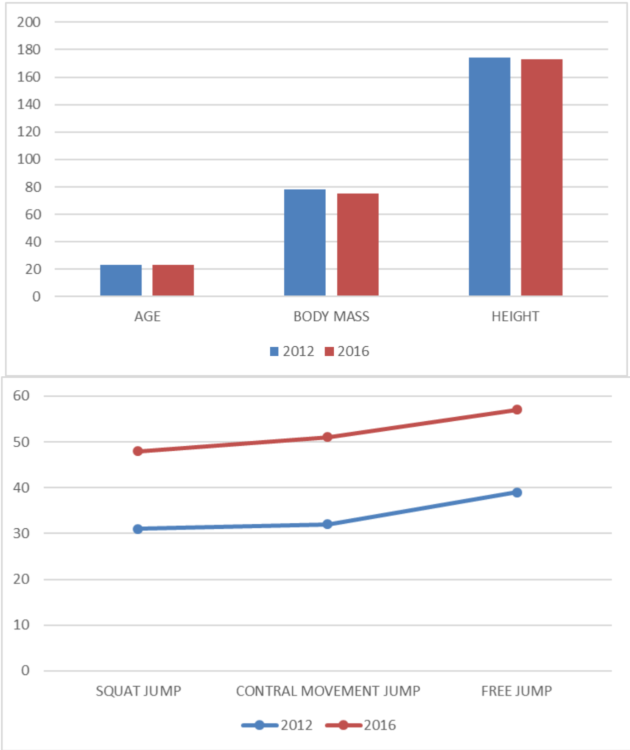

Figure 3. Halves results

In Figure 4, we see the comparison between the two second rows. We can observe significant differences in age and body mass. The 2016 show more appropriate results for a rugby first league second row, because the locks, through the nature of their attributions, are the players with the bigger height and body mass in a rugby team (Gabbett, 2002). Although the height is almost the same, the body mass difference is of 20 kg. The body mass is a key element for forwards, especially in the scrums and that is why the 2016 players show a better adaptation to the game needs (Nicholas, 1997).

The results of the explosive strength test are the most alike for the second row. The average results for squat jump and control movement jump are almost the same. The only notable difference is for the free jump, where we can see a better result for the 2016 second row. The results of the 2016 players are situated within the limits for international professional players (Branningan, 2016).

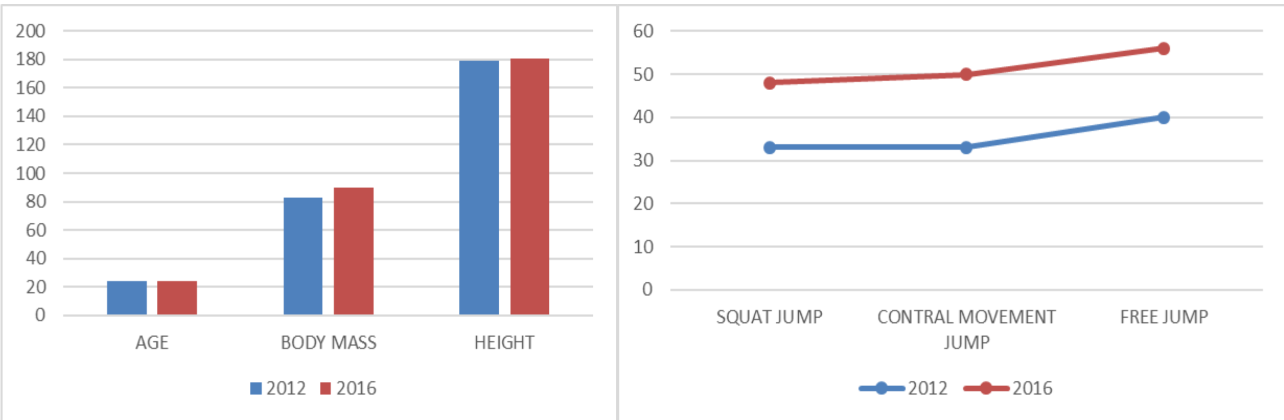

Figure 4. Centres results

In Figure 5, we see the comparison between the two third rows. We can observe significant differences in age, height and body mass. The 2016 players show more appropriate results for a rugby first league third row (Gabbett, 2002). The weight and height of the third row developed in the last 4 years, proving a good adaptation to the modern rugby requirements.

The results of the explosive strength test are significant better for the 2016 players in all three tests. In all three tests, differences are higher than 10 cm. Also, the players who were tested both times show a very good evolution over the 4-year period. The results of the 2016 players are situated within the limits for international professional players (Brannigan, 2016). The third liners show the best results in free jump test, and for the other two, they are on the same level with the front row players.

Figure 5. Wings and fullbacks results

The average total body mass of players mainly fits the profile of back line, with the exception of the halves (Gabbett, 2002). The main motor skill of these players is speed and agility that is why the body mass it is lower than for the forwards (Duthie et al., 2006). Concerning body fat percentage, it is at the upper limit, but it ranges within normal limits in the case of back line. Lean mass percentages vary in an inversely proportional manner from body fat percentage, but this variable does not exceed the normal limits in the players we tested. We calculated arithmetic means and standard deviations for lower body and upper body power and the power-speed couple for the lower body.

The results of the 'free jump' test are good for centres and halves, but low for wings and fullbacks, related to the level imposed by elite professional players. Concerning general power tests, the players rank at the lower limit of data generated by studies conducted on professional players within the global rugby elites, the halves present lower means than the normal. We consider these results good, taking into account the performance difference between the players we have tested and those within elite rugby (Pook, 2012).

In order to determine the way in which power is conditioned by body fat, we analysed graphically the variation of data by position. Therefore, Figure 3 shows the ratio between general lower body power, total body mass and body fat. It is worth highlighting that the power level tends to vary proportionally with total body fat, and mostly with total body mass. Hence, the centres have the highest level of body mass and also the highest strength on lower limbs. The halves present low level on body mass and also in lower limb strength. Even if the morphological differences between the centres and wings are small, the level of lower limbs power is way higher in the case of the centres (Gabbett, 2005).

5. Conclusion

It can be concluded that the results vary significant in a 4-year period for the players of the same team.

- The forwards improved significantly their explosive strength in a 4-year period. Although the total body mass got bigger, the players managed to improve their lower limbs explosive strength, this fact proved a good physical adaptation to the requirements of the rugby game.
- Even if only two-thirds of the initially players remained for the second test, the remaining players show very good adaptation of explosive strength and morphological characteristics.
- The best results are obtained by the front and third rows. The difference is only for free jump, which is better for third liners. Having in mind the weight difference between these two rows, we can conclude that the second hypothesis is only partially proved.

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