Ovidius University Annals, Series Physical Education and Sport / SCIENCE, MOVEMENT AND HEALTH
Vol. XXI, ISSUE 2 Supplement, 2021, Romania
The journal is indexed in: Ebsco, SPORTDiscus, INDEX COPERNICUS JOURNAL MASTER LIST,
DOAJ DIRECTORY OF OPEN ACCES JOURNALS, Caby, Gale Cengage Learning, Cabell's Directories

Science, Movement and Health, Vol. XXI, ISSUE 2 Supplement, 2021
September 2021, 21 (2): 331 - 336
Original article

EFFECTS OF THE PLYOMETRIC TRAINING PROGRAMME ON THE SPRINT AND THE AGILITY OF RUGBY 7 FEMININE PLAYERS

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Abstract

Objective. The modern rugby game is fast, at a sustained pace, which requires a lot of physical effort. The purpose of this study was to determine the effect of 8-week plyometric training on sprint performance and agility in women's rugby 7 players.

Methods. Twenty women's rugby players from the Romanian League I participated in this study. During the 8-week period, 2 workouts per week of plyometric lasting 60 minutes were applied. All subjects participated in three tests: 10 m distance speed, Illinois Agility Test and a force plate test for ground reaction times, before and after the application of the program. The processing of statistical data was done with the help of the SPSS V23 programme . In this research we used the t-dependent test to verify whether, after the period of application of the methods used in the experiment, significant progress was found or not. The research methods used are being represented by scientific documentation, experiment method, observation, measurement, statistical-mathematical method and the graphic one.

Results. The results of the t-test show that the difference in averages has reached the threshold of statistical significance, $p<0.001<0.05$. The decrease in time in final testing shows a significant increase in the responsiveness and agility of athletes.

Conclusions. The results of this study show that plyometric training can be an effective method of training to improve the sprinting and agility of an athlete.

Key words: reaction, performance, rugby 7, feminine.

Introduction

Rugby in Seven is a field-based and derivative team sport of the 15-player rugby union that requires a unique interaction of the players' well-developed physical, technical and tactical capabilities (Ross, Gill, & Cronin, 2015).

The modern rugby game is fast, fast, at a sustained pace, which involves a lot of physical exertion (Fuller, Raftery, Readhead, Targett & Molloy,2009).

Improving physical performance has important implications for team sports, as players perform numerous explosive moves, such as hitting, approaching, jumping, turning, sprinting and changing directions during the match (Chaouachi et al., 2009; Duncan et al., 2006; Gabbett, 2000; Ostojic et al., 2006; Stolen et al., 2005), thus, pliometric exercises usually involve in rugby, stopping, starting and changing directions in an explosive way (Gabbett, 2000).

Plyometrics is defined as rapid strong movements preceded by preloading counter movements that create stretch shortening cycles that cause an increase in muscle strength. In addition, authors have also described plyometrics as activities that allow a muscle to reach maximum strength in the shortest possible time. Ketreyan describes pliometric training as "jump training", and Quinn a specialized high-intensity training technique that is used to develop strength.The important findings of the studies mentioned above seem to indicate that a sport such as rugby would also benefit from a plyometric training programme.

Rugby is a power game due to the fact that power is required in the execution of tackles, explosive acceleration, scrummaging and powerful play during rucking and mauling. Despite the considerable variation in the fitness requirements of each position of the game, it is clear that all rugby players need a degree of speed, strength and power.

This claim is confirmed by, who hold the view that rugby generally requires speed, flexibility, endurance (muscle and cardiovascular), agility and strength. Since plyometric training can significantly improve speed, stamina, strength and power, it

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Received 17.02.2021 / Accepted 19.05. 2021

maybe recommended to apply this type of training method among rugby players.

Agility is the ability to quickly and efficiently change direction in response to a stimulus. Agility involves an explosive start, acceleration, change of direction and re-acceleability, while maintaining body control and minimizing speed loss. Since rugby is a game of invasion and evasion, agility is a very important factor to include in a training program. It has been shown that evasive agility maneuvers lead to 72% of successful breaks in rugby union (Engelbrecht et al, 2016). Agility is thought of as a physical concept, but concept, but involves a lot of cognitive processing to react to a given stimulus. As a result, a multilateral approach to the agility of training is needed.

The purpose of this study was to determine the effect of 8-week plyometric training on sprint performance and agility in women's rugby 7 players.

Methods

Twenty women's rugby players from the Romanian League I participated in this study. During the 8-week period, 2 workouts per week of plyometric lasting 60 minutes were applied.

Training began with a 20-minute warm-up with elements from the school of running and jumping and reaction games. The exercises applied were combinations of deep jumping, long jumping, repeated short-distance sprints and planned direction changes, but also unplanned to challenge the player both physically and mentally to the stimulus reaction.

The rugby player must be as fast as possible both in balloon situations and in the situations that the game requires. It is necessary to work as much sprints as during a match so over equivalent distances, in situations equivalent to or without the balloon, with or without the opponent. Recovery time must be respected, otherwise the work will be ineffective. Moreover, in order to work with specific reflexes and gestures, it is necessary to multiply the situations: visual, auditory, type of departure.

All subjects participated in three tests: 10 m distance speed, Illinois Agility Test and a force plate test for ground reaction times, before and after the application of the program. The processing of statistical data was done with the help of the SPSS V23 programme .

In this research we used the t-dependent test to verify whether, after the period of application of the methods used in the experiment, significant progress was found or not.

The research methods used are being represented by scientific documentation, experiment method, observation, measurement, statistical-mathematical method and the graphic one.

Results

Table 1. Speed running over a distance of 10 m.

Return Statistics Indicators	T.I.	T.F.
Mean	1.95	1.86
Median	1.96	1.90
Deviation std.	0.05	0.09
Minimum	1.87	1.71
Maximum	2.05	1.96
Amplitude	0.18	0.25
Coef. variability	2.8%	4.7%

Statistical indicators		Differences T.F.-T.I.
Mean		-0.09
Progress Rate		4.4%
95% Confidence Range		(-0.11 ; -0.06)
Bilateral dependent t-test	df	13
	t	6.74
	p	<0.001
Effect Size Index		1.80

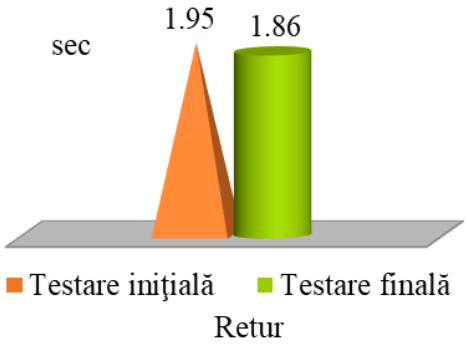

Figure 1. Difference of averages over distance of 10 m

According to Table 1 in the 10 m running test, the average time decreased by 0.09 sec from 1.95 to 1.86 sec. . The difference in averages is in the confidence range (-0.11 ; -0.06). The results are homogeneously dispersed in both tests. Verification of statistical significance with bilateral t-test revealed a difference in statistically significant averages, $p<0.001<0.05$. Reject the null hypothesis. The graphical representation of the averages and differences between the results obtained in the two return tests are shown in Figure 1.

Table 2. Synthesis

Mean diff.	Progress Rate	Size of difference (effect)	Diferenţa este:	ip. null
-0.09	4.4%	high to veri high	Semnificativ statistically	reject

The decrease in time in the final test shows a significant increase in reaction speed and power of rugby players.

Table 3. Illinois Agility Test

Indicators statistics Return	T.I.	T.F.
Mean	17.16	16.55
Median	17.20	16.58
Deviation std.	0.32	0.36
Minimum	16.48	16.15
Maximum	17.65	17.08
Amplitude	1.17	0.93
Coef. variability	1.9%	2.2%

Statistical indicators	Differences T.F.-T.I.	
Mean		-0.61
Progress Rate		3.6%
95% Confidence Range	(-0.75 ; -0.47)	
Bilateral dependent t-test	df	13
	t	9.33
	p	<0.001
Effect Size Index		2.49

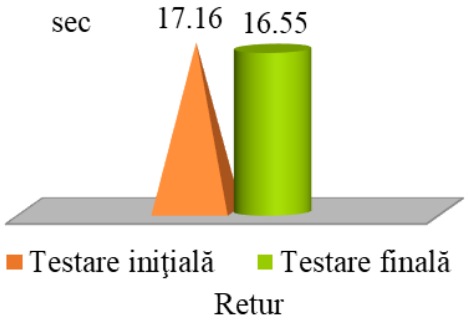

Figure 2. Difference of means Illinois Agility Test

According to Table 3 the average execution time of the Illionois test decreased by 0.61 sec from 17.16 to 16.55 sec. The difference in 95% averages is within the confidence range (-0.75 ; -0.47). The spread of results around the mean in both tests is homogeneous. The results of the t-test show that the difference in averages has reached the threshold of statistical significance, $p<0.001<0.05$. Table 4 shows that the null hypothesis is rejected. The means and differences between the results obtained from the two return tests are shown in Figure 2.

Table 4. Synthesis

Mean diff.	Progress Rate	Size of difference (effect)	Diferenţa este:	ip. null
-0.61	3.6%	high to veri high	Semnificativ statistically	reject

The decrease in the time of the Illionis test, on the final test, signifies an improvement in the agility of the athletes.

Table 5. Counter movement jump

Statistical Indicators Return	T.I.	T.F.
Mean	38.29	41.39
Median	38.30	41.26
Deviation std.	4.29	4.81
Minimum	32.82	35.04
Maximum	48.59	51.70
Amplitude	15.77	16.66
Coef. variability	11.2%	11.6%

Statistical indicators	Differences T.F.-T.I.	
Mean		3.10
Progress Rate		8.1%
95% Confidence Range	(1.78 ; 4.40)	
Bilateral dependent t-test	df	13
	t	5.10
	p	<0.001
Effect Size Index		1.36

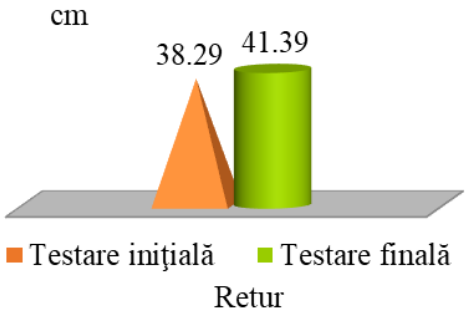

Figure 3. Difference of means CMJ

Table 5 shows that the mean jump detente in the opposite direction of movement (counter movement jump) increased by 3.10 cm from 38.29 to 41.39 cm. The difference in 95% averages is within the confidence range (1.78 ; Dispersion of results is homogeneous for the two tests. The results of the t-test show that the difference in averages has reached the threshold of statistical significance, $p<0.001<0.05$. According to Table 6, the null hypothesis is rejected. Figure 3 shows the graphical representation of the averages and the difference between the results obtained in the two return tests of the players following the application of the pliometric exercises.

Table 6. Synthesis

Means diff.	Progress Rate	Size of difference (effect)	The difference is:	ip. null
3.10	8.1%	high to very high	semnificativ statistically	reject

The increase in detente in the final test highlights a significant increase in the explosive elastic force of the lower limbs required for rugby players in most phases of the game.

Discussion

The statistical-mathematical analysis of the initial and final evaluations shows that the application of pliometric training leads to positive results in terms of the level of training of rugby players. The hypothesis of the work is fully confirmed, with all subjects recording significant improvements in the final evaluation.

Progress confirms that applying the pliometric method improves the capacity for effort and implicitly the ability to perform. The effort in the game of rugby is mixed, with a fluctuating dynamic, against the background of an aerobic capacity, with the piercings of the anaerobic system, decisive and decisive in some key situations of the game.

The results of this study show that plyometric training can be an effective method of training to improve the sprinting and agility of an athlete.

In the future, in women's rugby 7s, some aspects are required related to the individualization of training and the strict application of all aspects related to the restoration and regeneration of the capacity of effort, both in training and in competition.

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