ORIGINAL RESEARCH PAPER

ASSESSMENT OF MOTOR CAPACITY IN THE COMPETITION PERIOD – FEMALE SPORTS GAMES (SOCCER AND RUGBY SEVENS)

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Abstract

In the rugby and soccer sevens, players need special motor capacities, such as aerobic and anaerobic resistance, proper force in the muscles that work during game actions, as well as speed and agility. The purpose of the papers was to assess the motor capacity in the competition period, among female athletes who practice team sports. The study comprised 26 subjects, 12 of whom activate in the female rugby team of CS Politehnica Iasi, and 14 of whom belong to the soccer team of Naviobi Iasi. Both teams are champions in their leagues. We applied the following tests: 250m run, long jump without take-off, throwing the 2kg medicine ball, 30second abdominals, and 5m back and forth run. The data obtained were interpreted in SPSS 20.0 for IBM, by applying the t test for independent samples. Results have shown a significant difference ($p<0.05$). Significant differences were found only for the test that measured the force of abdominal muscles for which the female rugby players scored significantly higher than the rest. In all the other tests, the mean results were similar or very close. We found that the motor experience within the game influenced the results obtained, just like general physical training; they are both important for supporting the specific effort. The tests we applied mid-competition period.

Key words: *motor capacity, rugby sevens, female soccer, competition period.*

Introduction

The value of motor capacity, of exercise capacity and mostly of performance capacity results from the higher bodily adjustment to the intense physical and mental effort required by sports training (Dragnea,

p-ISSN: 1691-7669/e-ISSN: 1691-9912/ISO 3297

DOI: 10.1515/ljss-2016-0011

1991). Adjustment to effort is a self-regulation response of the body, which undergoes functional and morphological modifications and which reacts by optimizing the mechanisms that ensure fitness (Dragnea, 1996).

Stating the type of effort required by a competition within a certain sporting branch or event is the most important action of a coach (alongside the supporting team of specialists) and it represents the premise for a scientific planning and scheduling of the training. In sports games, this objective is significantly harder to attain than in individual sports, considering the specificity of actions corresponding to each function within the team.

Among the classification criteria for effort, the most objective and scientifically based one is the determination of the main source of energy necessary to support these efforts (Grosu, 2008; Ursanu, 2014).

Women's soccer and rugby sevens are relatively recent sports. Women's soccer participation continues to grow worldwide, with a concomitant increase in our understanding of the physical demands of women's matches (Bradley & Vescovi, 2015; Higham, et al., 2012; Vescovi & Favero, 2014).Their working methodology has not been scientifically founded yet and it has actually been taken over from the methodology of men's teams.

Under such circumstances, it is necessary to delimit the nature of the effort required by the competition, in order to schedule sports training.

In both sports branches, effort acquires the characteristics (Javier, et al., 2014; Morgans, et al., 2014, Elloumi, et al., 2012; Chihaia & Pop, 2012):

- an important anaerobic alactacid component during singular actions;
- an important anaerobic lactacid component while analyzing motor actions within technical and tactical combinations;
- a mixed effort component when analyzing the effort on game sequences (halves);
- an aerobic component when considering the entire process of a half.

One of the main principles of training in any sporting branch or event is represented by the specificity of the effort required by the competition period. In sports games, it is significantly more difficult to determine the type of effort than in individual sports. This aspect includes even more interesting aspects in women's sports. This is the reason why we considered it necessary to assess the motor capacity of female athletes within two relatively recent women's sports games: soccer and rugby

sevens. The analysis was conducted during the competition period (2014 – 2015 championship tour) of the training macro cycle.

Material and methods

Period and place of the research

The research was conducted in the period October – November 2014, in the "Emil Alexandrescu" Stadium Sports Complex in Iasi. We also mention that, in conformity with the Declaration of Helsinki, the Amsterdam Protocol and the Directive 86/609/EEC, we obtained the approval of the Ethics Committee of the Faculty of Physical Education and Sport in Iasi for research on human subjects, as well as the oral consent of coaches and of athletes who participated in the study.

Subjects and groups

The study included 26 female players, members of women's soccer teams (C.S. Navobi Iasi) and women's rugby sevens (C.S. Politehnica Iasi); their age mean is 21.92±2.35 (rugby, n=12) and 19.57±3.61 (soccer, n=14). Subjects usually have 6 – 7 hours of weekly practice, considering that most of them are high school students or university students. We add that both teams are in the higher rankings of the national championship for their sports.

Tests applied

To measure and assess motor capacity, we have applied the following tests:

- 250m run from a standing start (seconds) – it assesses the anaerobic lactacid endurance capacity. The test was conducted on the stadium, with start on command and one repetition (MacKenzie, 2005).
- standing long jump – SLJ (metres) – to assess the elastic leg strength. The athlete stands, arms at shoulder length, then crouches, leans forward, swings their arms backwards, then jumps horizontally as far as possible. Two attempts were performed and the best score was recorded (MacKenzie, 2005).
- 3kg medicine ball throw – MBT (meters) ball held overhead in two hands – to assess the elastic arm, back and abdominal strength. The athlete throws the ball for distance; a follow through step is allowed (MacKenzie, 2005). Each subject performed two attempts and the best throw was recorded.
- 30s sit up test – SUT (number of repetitions) – to assess the endurance of abdominal muscles (MacKenzie, 2005). Subjects had to lie on a mat with the knees bent, feet flat on the floor, then to curl up slowly at 90 degrees and return slowly to the starting

position and maintain it for 30s. We recorded the number of executions performed in one session.

- 5m repeating sprint test – 5m RST (meters) – to measure the player's endurance speed capacity and agility (Durandt, 2009). On a distance of 25m, the running course was marked by cones in 5m intervals. The subjects were asked to perform the test at full speed. The subjects started the test at the first cone and, upon the signal, they sprinted to cone 2, touching the base of the cone with one hand, then returned to the first cone, sprinted to the 10m point, then returned again to the first cones, and continued in this manner for 30s. The player's distance was recorded upon each repetition; the subjects executed six repetitions, with 35s rest.

Statistical processing

For statistical processing, we used SPSS 20.0 for Windows (minimum value, maximum value, mean±SD). The difference between means was calculated by applying the *t* test. However, the differences were considered significant at $p<0.05$. The correlations between testing results were determined using Pearson's coefficient (significance of $r>0.50$).

Results

Elastic strength of legs and arms. The values recorded in standing long jump indicate higher scores obtained by female rugby players in the two tests conducted: 1.94±0.19m and 7.95±0.99m, compared to the members of the soccer team, with 1.88±0.19m and 7.24±1.41m (Table 1 and Table 2).

Table 1

Motor capacity testing results, women's rugby sevens

	250m (s)	SLJ (m)	MBT (m)	SUT (no)	5m RST (m)
	52.52	1.75	7.10	41	680
	48.43	1.70	6.50	35	639
	41.01	1.78	6.90	39	666
	40.04	2.10	8.60	38	695
	46.18	2.10	10.00	34	661
	42.49	2.03	8.70	36	734
	41.02	2.05	8.50	38	674
	43.48	1.68	8.20	38	676
	44.33	1.92	7.40	34	658
	37.62	2.25	7.80	35	744
	47.01	1.83	7.10	38	642
	39.65	2.12	8.60	34	688
Minimum	37.62	1.68	6.50	34	639
Maximum	52.52	2.25	10.00	41	744
Mean	43.64	1.94	7.95	36.67	679.75
SD	±4.27	±0.19	±0.99	±2.30	±32.35

Table 2

Motor capacity testing results, women's soccer

	250m (s)	SLJ (m)	MBT (m)	SUT (no)	5m RST (m)
	38.66	2.10	8.00	33	712
	43.08	1.80	7.00	28	705
	40.84	2.00	6.20	46	720
	42.83	1.80	8.80	24	673
	45.58	1.60	5.80	27	658
	38.56	2.00	8.50	35	755
	46.74	2.10	8.90	25	715
	42.78	2.00	6.50	28	699
	44.98	1.80	6.10	31	665
	42.26	2.25	9.80	29	715
	44.73	1.70	7.70	27	637
	42.91	1.70	6.50	25	660
	44.53	1.80	4.80	30	680
	43.87	1.70	6.80	28	657
Minimum	38.56	1.60	4.80	24	657
Maximum	46.74	2.25	9.80	35	755
Mean	43.02	1.88	7.24	29.71	689.36
SD	±2.39	±0.19	1.41	±5.59	±32.81

However, it must be noted that both categories of subjects record values "below the mean" (by 1.50m) compared to values predicted for performance athletes (MacKenzie, 2005).

We did not find statistically significant differences in any of the tests conducted (Table 3).

Table 3

T tests between independent samples (Rugby -Ro – Soccer-So)

	Ru-So	Ru-So	Ru-So	Ru-So	Ru-So
Difference	0.61	0.06	0.70	6.95	-9.60
t	0.463	0.802	1.451	4.013	-0.749
p	>0.05	>0.05	>0.05	<0.05	>0.05

Medicine ball throw recorded a statistically insignificant difference (Table 3) of 0.70 m between the two groups (mean of 7.95m vs. 7.24m).

Strength of abdominal muscles. The test for assessing abdominal muscles (curl up test – 30s) has shown significant differences between the two groups: the rugby players obtained a significantly higher mean, namely 36.67±2.30 repetitions (Table 1) compared to soccer players: 29.71±5.59 repetitions (Table 2). It is worth highlighting that, in this test, both groups recorded values ranging in the category of "excellent" according to MacKenzie, (2005) while the difference between groups was significant (Table 3).

Endurance speed capacity ("shuttle" test) underscores higher values for soccer players, with a mean of 689.36m, compared to the rugby players, with a mean of 679.75m; however, the difference is not significant (Table 3).

The test conducted to assess *anaerobic lactacid endurance* (250 m run from a standing start) highlights almost equal values: the difference is just 0.61 seconds in favour of soccer players (Table 3).

Table 4 features the results obtained by the rugby team after applying Pearson's correlation for the five tests. The 250m test correlated significantly with SLJ and MBT, while the SLJ test correlated with MBT and 5m RST

Table 4

Pearson's correlation – rugby

	SLJ	MBT	SUT	5m RST
250m	-0.661*	-0.345	0.307	-0.571*
SLJ		0.644*	-0.488	0.628*
MBT			-0.351	0.341
SUT				-0.077

*correlation is significant at the 0.05 level (2-tailed)

In women's soccer team, the 250m test correlates significantly with all the other tests except SLJ (Table 5).

Table 5

Pearson's correlation – soccer

	LFE	AMM	ABD	5m RST
250m	-0.448	-0.266	-0.566**	-0.623*
LFE		0.606*	-0.335	0.793**
AMM			-0.194	0.411
ABD				0.511

*correlation is significant at the 0.05 level (2-tailed)
**correlation is significant at the 0.01 level (2-tailed)

The correlation between SLJ and 5m RST is also significant.

Discussions

Within the past few years, the number of female players in soccer and rugby sevens in Romania has increased. The female athletes are part of various clubs that participate to competitions of various levels (from local to international level, and for different age categories). This provided the athletes with the possibility of training and competing in different environments, – either recreational or competitive – thus leading to an increase in expectations for female athletic performance. This also requires

further studies and research to support specialists, in order to improve physical, technical or other types of training levels.

The purpose of our study was to assess the motor capacity of female athletes within two relatively new sports in Romania: women's soccer and rugby sevens. We conducted the analysis during the competition period (2014 – 2015 championship tour) of the training macro cycle.

The endurance speed capacity assessed through the 5m RST test showed an insignificant difference ($p>0.05$) between rugby and soccer players; the same result was obtained at the 250m test. The capacity to accelerate is a primordial quality for the soccer game (Little & Williams, 2005) and an important indicator for assessing the player's skills in the rugby game (Henne & Basset 2013).

The results obtained by the two groups at tests that measured elastic leg and arm strength did not show any significant differences ($p>0.05$). In the soccer game, elastic leg strength is believed to correlate positively with the attaining of performance (Turnerm, et al., 2011). In the game of rugby sevens, Paquet (2014) suggests that high speed and force are indispensable qualities.

The abdominal muscle force is the only test that showed significant differences between the two groups ($p>0.05$).

Because we found no model of effort drafted by specialized federations for comparison, we posit – based on the results recorded and analyzed – that the effort parameters of the two team members are at an ideal level. This statement is also highlighted by the results recorded in the national competition and at international events.

In order to formulate a series of reliable appraisals of the training level recorded by the subjects of our study (in this stage of the training macrocycle), we considered it useful to analyze the correlation between the control tests administered. Therefore, concerning the female rugby players (Table 4), we found high values of the correlation ($r>0.05$) between the 250m test (that requires good anaerobic lactacid effort) and the SLJ and 5m RST tests. The rather high value of the correlation between 250m and 5m RST acquires connotations that are significantly more relevant if we consider that the two control tests involve anaerobic lactacid effort and a high rate of lactic acid (thus very close to the competition-specific effort within both sports branches).

Concerning women's soccer team subjects, the correlation index between the 250m and the 5m RST is even closer to the significance level (-0.623), which further highlights the similar efforts required by the two tests. The correlation between 250m and 5m RST with SLJ and MBT shows

insignificant values: this aspect is justified by the fact that both the SLJ and the MBT underlined, almost exclusively, values of elastic strength.

Following the studies conducted during FIFA Women's World Cup in Germany, 2011(http://www.fifa.com/womensworldcup/archive/germany2011/index.html), Martinez-Lagunas et al. (2014) studied the topic of motor capacities. They concluded that female players should be tested regularly using objective evaluations and considering certain performance standards, in order to pinpoint their strong and their weak points. This may prove useful for assessing the efficiency of a specific training program and for identifying the training levels by training stage. Despite the growing popularity and development of women's soccer around the world, the scientific research specific to female players compared to male players is still far from exhaustive, especially concerning the physical and physiological characteristics of players.

The female rugby sevens is a relatively new sport: it has been listed as an Olympic sport for the 2016 Rio de Janeiro Olympic Games (Paquet, 2014; Higham, et al., 2014). Female players need great physical skills, from speed and agility to aerobic and anaerobic resistance, as well as muscle force (Henne, et al., 2011). In the scientific sports literature, varieties of tests have been used in rugby to measure the motor capacity of players. This means that it is impossible to compare the results obtained in the previous studies (Johnston & Gabbett 2011; Lockie, et al., 2012).

In the competition period analyzed in our study, both teams had two or three specific physical training practices included in their weekly training microcycle. The practices were meant to maintain performance capacity at an optimal level, specific to athletic form plateau. The results recorded for tests concerning the dominant motor skills for both sports branches (endurance during strength training and endurance during speed training) highlight a judicious methodical orientation specific to the effort required by their training stage.

In the opinion of Clark et al. (2003), athletes are well trained when they have enough energy to reach and maintain balance in terms of competition effort; they believe it is an essential condition for obtaining optimal sports performance. Therefore, the capacity of elite players to acquire and maintain performance capacity in the pre-season and in the season period has become an extremely important element (Caldwell & Peters 2009).

Conclusions

The female soccer players scored higher in elastic leg and arm strength, but the values were insignificant and below the mean, compared to the results expected for performance athletes.

Abdominal muscle force showed significant differences between the groups: the components of the rugby team had higher scores.

Similar values were recorded for both the test assessing the lactic anaerobic resistance, and the endurance speed.

Concerning the rugby team, it is worth underscoring the high values of the correlation between the 250m, 5m RST, and the SLJ tests; concerning the soccer team, the correlations between the 250m, the 5m RST, and the SUT tests are notable. In both groups, we found a strong and positive correlation between SLJ and 5m RST.

The correlation between the 5m RST and the SLJ and the MBT tests showed insignificant values; this aspect is justified by the fact that the SLJ and the MBT highlight, almost exclusively, values of elastic strength.

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Submitted: April 11, 2016
Accepted: June 20, 2016