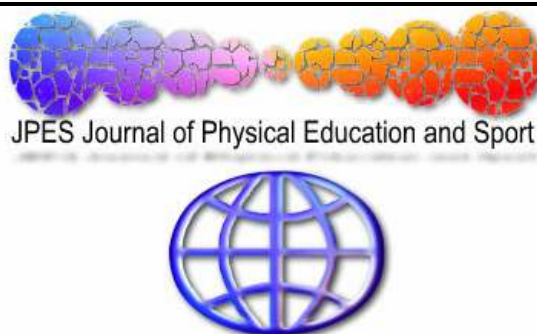




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ORIGINAL RESEARCH

OPTIMIZING THE MUSCULAR TRAINING THROUGH ALTERNATED CONTRACTION REGYMES AT JUNIOR FEMALE PLAYERS I

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Introduction

The muscular training is amongst the most important factors and, in some cases, indeed the primordial ingredient of the sport training with a view to reaching high performance results, for it influences the manner in which the training is organized throughout the macro-cycle stages. It must be done organically and well balanced for each motrical aptitude solicited by the practice of the performance volleyball.

The selection of the muscular groups must be done in accordance with the technical requirements imposed by that sport branch, with the purpose of highly training the muscular groups implied in the specific movements, allowing the techno-tactical actions to be executed at high potential.

The physical training of sportsmen implies best establishing the relation in between the physical preparation, techno-tactical training and psychological training. The interdependency of the sport training factors is of major importance, as is the dominant physical training part. The need to continuously grow the specific and predominant motric qualities is one of the conditions of raising the players' efficiency. The muscular training is accomplished both by separate trainings inside the force room as through training sessions specific to volleyball, by appealing to muscle exercises. It is very important to alternate these training throughout the preparation, in order to obtain the desired effects, while the used means must be in accordance with the game pre-requisites.

When it comes to the muscular volleyball training, it is imperative that we consider the following aspects: the game specifics, the game concept, the players' specificities, the post characteristics, the game evolution tendencies, as well as optimizing the preparation.

The research purpose: is that of bettering the muscular training during the preparation process of the female junior I volleyball players, adapted to the game tasks, through elaborating and confirmation of the alternate contraction regimes programs, thus ensuring an optimal and rationalized training, with the purpose of reaching the proposed performance objectives.

The research hypothesis: by using the alternated contraction regimes to adapt the muscular training to the players' posts and morpho-functional particularities, we consider that we may determine the increase of the players' performance abilities.

Investigation methods: analysis and generalization of the special field of interest data, the measurements and tests method, the pedagogical experiment and the statistic-mathematical method.

Applied test trials:

- Throwing the medicinal ball (3kg);
- Abdomen exercises;
- Press genuflexions (1RM);
- Chest push-ups from a laid position (1RM).

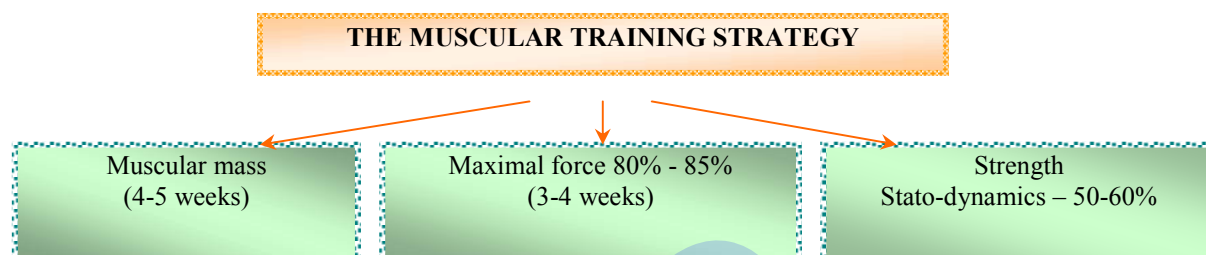
Organizing and unfolding the experiment

The pedagogical experiment we organized all throughout the June 2007 and May 2008 competition year consisted in a series of alternated (isometric-plyometric) muscular regime programs, applied to an experimental group (LPS Pitesti), whose results we compared to those of a witness group (the Craiova “Nicolae Titulescu” National College) that unfolded its activity according to the annual curricula, based on the coach proposed means.

Thus, as this very age (16-18 years), one of the main objectives from the training program was represented by the stress put on developing a solid anatomic and physiologic background.

The force-speed combination is quite decisive inside contemporary volleyball, while maximal force best benefits from speed transfers, as solicited by the game of volleyball. This is the reason why the muscular areas mostly involved in volleyball are specifically resorted to by making use of the contraction regimes and useful force indices so very much needed inside this activity.

In order to improve this aspect, the following strategy has been applied:



The muscular training strategy used for LPS Pitesti

The maximal force was obtained through the use of high loads, usually in between 80-85%. Developing the maximal force had the objective of developing the player's ability to recruit the highest number of muscular fibers, having as effect defeating resistance.

The stage that presupposes developing the players' strength through specific training including the use of loads 50-60% 1RM smaller when developing force, but also a higher execution speed and the use of medicinal balls and plyometrics. The result of this force training presupposes the increase of the reaction speed.

The force training was planned in correlation with other type of activities: technical-tactical exercise, speed training, resistance training. During the competition period, the trainings were meant to maintain the level of maximal force and strength reached after the preparation period, in order to facilitate obtaining performance during competitions. As for the transition period, we did organize some training, to contribute to the balanced muscular development.

We targeted the application of exercises ensuring the development of the superior muscles (improving the arms force and strength for the attack and serve ball), of the inferior ones (increase of power and explosion), of the back and abdominal muscles.

The most important aspect of the muscular training was the very choice of exercise and planning the preparation programs, for each female player shows different indices that need to be worked on in order to increase the game efficiency.

DEVELOPING THE MAXIMAL FORCE

Through alternate regimes (isometric – plyometric + isometric – plyometric)

1 The inferior limbs muscles Dosage: 3 SERIES X 10'', 14 + 10'', 10 Pauză: 1-2 minute	2 The inferior limbs muscles Dosage: 3 SERIES X 10'', 14 + 10'', 10 Pauză: 1-2 minute
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DEVELOPING THE SPECIFIC FORCE

Through alternate regimes (isometric – plyometric + isometric – plyometric)

2
The superior limbs muscles

Dosage: 5 SERIES X 10'', 21, 21 + 10'', 14, 14
 Pauză: 1-2 minute

Data analysis and interpretation:

The first trial subjected to the test was: “the throw of the medicinal ball”, for which the initial testing registered values of 4,70 m for the experimental group, versus 4.37 m at the witness group, while the final testing showed a 0.72 m progress of the experimental group, over a progress of 0.28 cm in the case of the witness group. The variability coefficient shows a high level of homogeneity both for the experimental, as for the witness group.

The “t” value in between the initial and final testing is of 2.373 (significant at a $p < 0,05$) for the experimental group and 1.666 (non-significant) for the witness group.

As for the game leader post, the experimental group scored a progress of 0.95m, while for the witness one, the value was of 0.25m. The value of the Student test (“t” dependant) is of 6.423 (significant $p < 0,01$) for the experimental group and 0.783 (non-significant) for the witness group.

The main players of the experimental group scored a progress of 0.70m, while the witness group showed a progress of 0.20 m. The “t” value from Fischer table is of 7.526 ($p < 0,005$) for the experimental group and of 0.651 (non-significant) for the witness group.

The table 1 graphic representation is eloquent for the results obtained by the two groups all throughout the experiment.

Table no. 1 The initial-final test results and the dynamics of the force indicator in the “ 3kg medicinal ball throw” for the experimental and witness groups

Tested trial	Group		Post/ no of players					
			Game leader n=2	Main player n=3	Secondary player n=3	Universal player n=2	Libero n=2	Team n=12
Throw of the 3kg medicinal ball (m)	Experimental group	TI	4,45	4,83	4,53	5,55	4,2	4,70
		TF	5,40	5,53	5,26	6	4,92	5,42
		Dif. med	0,95	0,70	0,73	0,45	0,72	0,72
	Witness group	TI	3,95	4,4	4,5	4,85	4,07	4,37
		TF	4,2	4,6	4,8	5,1	4,35	4,65
		Dif. med	0,25	0,2	0,3	0,25	0,28	0,28

Another trial applied inside our experiment was that of the “abdominal exercises on 30””. As it can be noticed in table 12.3.3, there was a slight difference in between the values of the two groups (the experimental group with 26.08 no of repetitions versus the witness group with 24.25 no of repetitions). In the final testing, a progress of 5.25 repetitions was registered in the case of the experiment group and of 2.91 repetitions for the witness group.

The “T” value for the experimental group is of 2.733 (significant for $p < 0,005$), while for the witness group, its value is of 2.827 (significant for $p < 0,01$). With regards to the variability coefficient, this one registers values indicating a high homogeneity both inside the experimental group (13.91%), as for the witness group (10.56%, 9.12%).

The players specialized as *game leaders* of the experimental group have scored a significant progress of 7 repetitions, while the witness group obtained a progress of only 3.5 repetitions. The value of “t” is of 7,007 (significant $p < 0,01$) for the experiment group and 3.133 (non-significant) for the witness group.

The players specialized as “leaders” obtained an increase of 5.37 repetitions for the experimental group and of 2.3 repetitions for the witness group. The value of the Student test is of 5.410 (significant for $p < 0,01$) in the case of the experimental group and of 0.655 (non-significant) for the components of the witness group.

The “secondary players” of the experimental group had an arithmetic average of 30 repetitions for the initial testing, respectively of 34 repetitions for the final testing; the control group progressed from 27 to 29.3 repetitions. The value of the associated Student test is of 3.679 ($p < 0,01$) for the experimental group and of 1.134 (non-significant) for the components of the witness group.

The players specialized as “false (universal players)” of the experimental group have obtained a progress of 6 repetitions, while those from the witness group have obtained a progress of 4 repetitions. The value of “T” is of 3.671 (significant for $p < 0,05$) for the experimental group and of 2.544 (non-significant) for the witness group.

The libero players of the experimental group have obtained a progress of 4.5 repetitions, while those of the witness group have obtained 3 repetitions. The “T” value from Fischer’s table is of 4.859 (significant $p < 0,05$) for the experiment group and of 4.275 (significant for $p < 0,01$) for the witness group. The results obtained are displayed in table no 2.

Table no2. The results in the initial and final testing and the dynamics of the force indicator for the “abdominal 30”” at the experimental and witness groups

Tested trial	Tested group		Post/no of players					
			Game leader n=2	Main player n=3	Secondary player n=3	Universal player n=2	Libero n=2	Team n=12
Abdomen 30” (no of repetitions)	Experimental	TI	21	25,66	30	26	26	26,08
		TF	28	31	34	32	30,5	31,33
		Dif. med	7	5,34	4	6	4,5	5,25
	The witness	TI	21	25,66	27	25,5	23,5	24,25
		TF	24,5	25,6	29,3	29,5	26,5	27,16
		Dif. med	3,5	5,34	2,3	4	3	2,91

The “*chest push-ups from a laid position*” through which we tested the maximal arms force shows a significant progress in between the initial and final testing of 12.33 kg at the experimental group and of 2.91 kg for the witness group.

The “t” value for the experimental group is of 4.376 ($p < 0,001$), and of 1.997 (non-significant). As for the variability coefficient, it has values that indicate a high homogeneity both for the experimental group (6.13%, 7.68%), as for the witness group (6.794%, 5.682%).

The players specialized on the post of *game leader* registered a progress of 12.5 kg for the experimental group and of 1.5 kg for the witness group. The “t” value is of 8.425 ($p < 0,01$) for the experiment group and of 1.090 (non-significant) for the witness group.

The ones acting as *main players* have obtained an increase of 13.66kg for the experimental group and of 3.34 kg for the witness group. The value of the Student test is of 10.25 ($p < 0,001$) for the experimental group and of 1.211 (non-significant) for the witness group.

The *secondary players* of the experimental group have scored an average of 38.66 kg in the initial test and respectively of 51 kg in the final testing; the control group started from 37.66 kg and reached 40.66 kg. The value of the Student test is of 8.510 ($p < 0,005$) for the experimental group and of 1.459 (non-significant) for the components of the witness group.

The players specialized as *false (universal players)* of the experimental group have obtained a progress of 12kg versus that of 3.5 kg of the witness group. The “t” value is the following one: 3.157 ($p < 0,05$) for the experimental group and 2.655 (non-significant) for the witness group.

The *libero* players of the experimental group have obtained an increase of 10.5kg, while those from the witness group have improved by 3 kg. The “t” value is of 9.433 ($p < 0,01$) for the experiment group and 2.676 (non-significant) for the witness group. The results are graphically shown in table no3.

Table no 3. The results in the initial –final testing and the dynamics of the force indicator for the “chest push-up-s from a laid position”- the experimental and witness group.

Trial	The tested group		Post/ no of players					
			Game leader n=2	Main leader n=3	Secondary player n=3	Universal player n=2	Libero n=2	Team n=12
Chest push-up-s from a laid position (kg)	The experiem	TI	41	42	38,66	39,5	36	39,58
		TF	53,5	55,66	51	51,5	46,5	51,91
		Dif. med	12,5	13,66	12,34	12	10,5	12,33
	The witness	TI	43	40,66	37,66	41	37	39,75
		TF	44,5	44	40,66	44,5	40	42,66
		Dif. med	1,5	3,34	3	3,5	3	2,91

Another trial applied with a view to testing the maximal force (1RM) of the inferior limbs was that of the press genuflexions. As can be noticed from table 12.3.4, the initial testing showed a small difference in between the values of the two groups (the experimental group: 129.3 kg versus the witness group: 131.25 kg). The final test showed a 26.53 kg progress for the experiment group and 8.75 kg in the case of the witness group.

The “t” value for the experimental group is of 4.135 ($p < 0,001$), while for the witness group, the “t” is of 2.455 ($p < 0,05$). The variability coefficient reaches values that show a great homogeneity both for the experimental (6,46%, 6,95%) and for the witness group (5,92%, 5,77%).

The players specialized as *game leaders* inside the experimental group have an average of 132,5 kg in the initial test versus 162.5 kg in the final test (30 kg progress), while the control group has an average of 132 kg in the initial testing versus 141 kg in the final trial (a9kg progress). The “T” value calculated in between the initial and final test is of 10.434 (significant for $p < 0,01$) for the experiment group and of 2.111 (non-significant) for the witness group.

The *main players* from the experimental group have registered an average of 131.66 kg for the initial testing and 155 kg for the final one. The value of the Student test, calculated in between the initial and final testing, indicates 7.006 (significant $p < 0,005$), and 4.008 for the witness group (significant $p < 0,05$).

The *secondary* experiment team players have scored a progress of 33.33 kg in between the two testings, while those from the witness group have progressed by 8.33 kg. As for the “t” value, calculated in between the initial and final test, the results are significant for both the experimental ($p < 0,005$) and the witness group ($p < 0,05$).

The *false post of universal player* of the experimental group resulted in a 22.5 kg progress sin between the initial test (137.5kg) and the final one (160kg); the witness group progressed by 9.5 kg in between the two tests. The “t” value from Fischer’s table corresponds to for the experiment group at $p < 0,01$ (9,014) and is not significant for the witness group (2,311).

The *libero* players of the experimental group obtained an arithmetic average of 113.5kg in the initial test and 135 kg in the final one. For the witness group, the initial test was scored with an average of 119.5kg versus 127 kg in the final test trial. The “t” test shows a $p < 0,005$ (14,342) for the experiment group and is non-significant for the witness group (3,009).

Table no 4. The results in the initial-final tests and the dynamics of the force indicator evolution at the “press genuflexion” trial for the experimental and the witness groups

Trial	Tested group	Post/ no of players						
			Game leader n=2	Main player n=3	Secondary player n=3	Universal player n=2	Libero n=2	Team n=12
Press genuflexions (kg)	The experime	TI	132,5	131,66	130	137,5	113,5	129,3
		TF	162,5	155	163,33	160	135	155,83
		Dif. med	30	23,34	33,33	22,5	21,5	26,53
	The witness	TI	132	133	131,33	139,5	119,5	131,25
		TF	141	142,33	139,66	149	127	140
		Dif. med	9	9,33	8,33	9,5	7,5	8,74

Following the application of the “t” test in the 4 trials specific to the indices of muscular training, we may observe that the experimental group obtained significant values for 4 out of the 4 trials (abdomen30”, throw of the medicinal3kg ball, chest push-up-s from a laid position, press genuflexions), while the witness group only obtained significant values at 2 tests (abdomen 30” and press genuflexions). Table no 5 displays the scored results.

Table no 5. The results in the initial-final test and the dynamics of the evolution of the force indicator at the 4 tests, both for the experimental, as for the witness group

No.	Group		Abdomen 30” (no of repetitions)		Throw of the medicinal 3 kg ball (m)		Chest push-up-s from a laid position (kg)		Press genuflexions (kg)	
			TI	TF	TI	TF	TI	TF	TI	TF
1.	The experimental team n=12	X	26,08	31,33	4,70	5,42	39,58	51,91	129,3	155,83
		S	3,62	2,605	0,703	0,513	2,42	3,98	8,35	10,83
		Cv	13,91%	8,31%	14,94%	9,46%	6,13%	7,68%	6,46%	6,95%
		t	3,733		2,737		4,376		4,135	
		p	significant <0,005		significant <0,05		significant <0,001		significant <0,001	
2.	The witness team n=12	X	24,25	27,16	4,37	4,65	39,75	42,66	131,25	140
		S	2,562	2,480	0,415	0,412	2,70	2,42	7,78	8,07
		Cv	10,56%	9,12%	9,49%	8,86%	6,794%	5,682%	5,929%	5,77%
		t	2,827		1,666		1,997		2,455	
		p	significant <0,01		Non-significant		Non-significant		significant <0,05	

Conclusions:

The means targeting the muscular training through alternated contraction regimes have been adapted to the objectives and requests of each preparation period.

The use of the alternated contraction regimes for training purposes lead to accomplishing a superiour muscular training of the female junior volleyball players, through improving the force indicators.

The elaborated muscular training programs have enclosed exercises that clearly set the number of repetitions and series, in function of the female player’ capacity to deal with effort; the length of the pauses was also a pre-established element.

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