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DIFFERENTIATED DEVELOPMENT OF MUSCULAR STRENGTH AT THE SEMI-LONG-DISTANCE FEMALE RUNNERS (800-1500 M) WITH DIFFERENT QUALIFICATION LEVEL

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Abstract. *In this article it is studied the special physical training issue of the semi-long-distance female runners in terms of different prominence of the methods and training means, suitable for this aim. It were highlighted the peculiarities of building capacity force according to age, also the means and methods of the force preparation differently applied in the runners preparation process on the distances of 800 and 1500m with different levels of qualifications as well as the methodology development of different force capabilities to it – force in speed mode, force in strength mode and endurance in speed- resistance mode - combined motor qualities that determine in a large measure the performance in this athletics trial.*

Keywords: *force, power, starting force, sports training, moving ability skills, high athletic skills, optimization, timing, middle distance, special physical training.*

Actuality. Due to the improvement of the semi-long-distance female runners, especially on the distance of 800m, arises the problem of streamlining the training process through the rationalization of special physical preparation. This will be done through the efficient development of special physical qualities necessary to semi-long-distance female runners, especially the capacity of force: force in the speed condition, force under strength condition and resistance under a speed-force – combined motion qualities which leads in a great way the performance in this athletics trial [1, 2, 5, 7]. We support the idea that the determinants of performance are and limiting factors, when their value does not meet the aspirations of performance, and among the limiting factors generated by the low level of semi-long-distance female runners specific force, as in the sprint, literature identifies the following: starting power to start, acceleration power, power resistance [3].

The specialized studied literature extensively expose particular aspects of means and methods of training for this group of trials, in general, and those of education and development of motor skills, especially [1, 4, 6, 8, 9].

The issue of restructuring workout efforts within the annual cycle of junior semi-long-distance female runners preparation to optimize sports performance, focused on one or more factors specific training, is a theme addressed and analyzed from different perspectives of many specialists [6, 10].

From the analysis of this information was found that very few authors detail the means and methods used to develop force, although all see it as a contributing factor in achieving or limiting performance in trials of 800-1500m. Considering the trend of "narrow specialization", from the last decades in semi-long distance runs, it appears necessary to approach the training process through the rationalization of preparation methods application, taking into account the real needs of the run trial. Running the distance of 800m sometimes, rightly, is called "extended sprint," because running speeds have raised a lot, and the specific training needs of the force and force-speed become more obvious. Therefore, we believe that solving this problem gets a really actual aspect.

The goal of this research consists in improving the methodology of the specific physical preparation of semi-long-distance female runners, through the rationalization of applying differen-

tiated means of force training character, depending on the level of their training.

Research methods used: scientific-methodic specialized literature analysis, closed pedagogical observations, pedagogical experiment, pedagogical control research and statistical and mathematical method of processing digital data.

To investigate the influence of different nature means of force and force-speed competition on the outcome of the semi-long distance race, it were applied 24 evaluation parameters - anatomical, physiological, specific training, strength and expansion / power legs. They were applied to identify the influence of various means of education / detent force development and legs on the performance ability for the semi-long distance trial. For this purpose we used pedagogical control research by applying samples and assessment tests. The research was conducted at the most valuable semi-long distance female runners from Romania. Depending on the outcome in the sample of 800, it were made up three value groups of semi-long distance female runners, so: I level, performance between 119.34 to 128.00 sec., eight sportswomen; II level, performance between 125.56 -139.00 sec., ten sportswomen; III level, performance between 139.00 to 156.00 sec., ten sportswomen.

The experimental group was composed of 12 athletes, semi-long distance runners, II level performance (800 m: 126.56 – 139,00sec.), who were prepared directly with their coaches, based on education/development didactic strategy of the force developed by us, examined and discussed in the technical Commission of the Romanian Athletics Federation, approved by the Federal Council.

Teaching strategy was based on the physiological, biomechanical and methodological principles drawn from the specialized literature, it was based on conclusions taken from the survey conducted and the linear correlations determined between the dependent variables (the force segmentation expressed by the value results from assessment tests of specific force) and dependent variables (results achieved in competitions distances of 800 and 1500m) and, not least, personal experience of the authors. In the training program it was taken into account all the principles, rules, requirements recommended by the literature and prior research findings. The women were prepared under national group or club with their technicians, who have joined the experimental program. During the macro-cycle year, we worked with them permanently. The athletes participated in the measurement and evaluation actions according to a schedule with specific dates, in agreement with their coaches. Measurements, evaluation, processing and analysis were performed, observing all the specific requirements of educational research. In the experimental study we used the same parameters of evaluation methodology to determine the influence of training on performance capacity, expressed in the result of the contest. Their level was studied and analyzed in dynamics during the annual training cycle (2009/2010).

To determine the influence that had the independent variables, means (exercises, materials, facilities, equipment, intra-effort rehabilitation) used in the experimental strategy to prepare strength / power, it was preceded to the parameters set by us, the 10 evaluation samples, in dynamic from the testing one, corresponding to the results achieved by athletes experiment group, in evaluation of the period 2009-2010 (the third testing, conducted at the end of the experiment in June 2010). Following the analysis of statistical indicators expressing the ten independent variables and their effect on the dependent variable, the result of the 800m trial, it was found that the performance level of the athletes is increasing, manifested by decreasing travel time of the distance contest level, arithmetic average from 133.18 to 129.34 sec. The coefficient of variation has values indicating a high degree of homogeneity of the group and the standard deviation varies between 4.64 to 3.69 sec., allowing the interpre-

tation of results at medium level, characterizing accurately the group analyzed.

For a more accurate analysis of the recorded differences between the testing 1 and 3, at the used evaluation samples, it was determined and the level of their mathematical meanings by using the criterion of "t" - Student. The determined values and significance threshold for each independent variable are summarized in Table 1. We note that for all samples of the specific force level, the differences are significant for the value of 5 and 1% (P <0.05 to 0.01). The linear correlations between the independent variables and the dependent variable were determined and at T2 and T3, thereby making it possible to analyze the dynamics during the experiment.

Table1. The significance of differences between the initial and final testing for each research indicator, x±m (n=12)

Nr. crt.	INDICATORS	x±m	x±m	t	P
1	Performance on the 800m distance (sec)	133,18±1,4	129,34±1,12	3,84	<0,01
2	Vertical jump (cm)	36,08±1.32	42,58±0,82	3,68	<0,01
3	10 jumps on the strong leg (m)	19,65±0,4	20,55±0,26	3,10	<0,05
4	Jumped step on the 100m distance (nr. of steps)	46,17±0,65	42,83±0,77	3,95	<0,01
5	Jump in depth – Vertical jump (cm)	37,42±1,48	43,00±0,64	3,34	<0,01
6	Jump in depth, 3 seconds pause – Vertical jump (cm)	36,00±1,1	41,42±0,56	4,58	<0,01
7	300m running, max. intensity, 30 seconds pause – standing decasalt (m)	21,53±0,30	23,50±0,47	3,69	<0,01
8	20 genuflections with the dumbbell using 50% of body weight (sec)	29,50±0,64	27,61±0.30	3,04	<0,05
9	Absolute static force of the flexor muscles of the shanks (kg)	77,67±3,64	88,83±2,78	3,75	<0,01
10	Absolute static force of the leg extensor muscles (kg)	50,42±2,60	61,42±2,97	3,32	<0,01
11	Absolute static force of the flexor muscles of leg on the thigh (kg)	27,25±1,65	37.17±1,74	4,24	<0,01
12	Absolute static force of the thigh extensor muscles (kg)	50,08±1,75	56,33±0,97	4,11	<0,01
13	Absolute static force of the thigh flexor muscles (kg)	27,58±1,32	36,17±2,10	3,04	<0,05
14	Relative force of the flexor muscles of the legs (kg)	1,53±0,05	1,75±0,04	3,85	<0,01
15	Relative force of the extensor muscles of the shanks (kg)	1,00±0,05	1,22±0,05	3,49	<0,01
16	Relative force of the flexor muscles of the shanks on thigh (kg)	0,54±0,03	0,73±0,06	3,27	<0,01

Note: The critical value of ***t*** for n=11 will be: P=0,05, t ≥ 2,201; P=0,01, t ≥3,11.

Linear correlations between the independent variables and the dependent variable were determined and at T2 and T3, thereby making it possible to analyze the dynamics during the experiment (Table 2).

The results presented in the 2 Table confirms that the female athletes of the experimental group improve their parameters of the specific force, the values of the correlations approaching to the ones identified at the group of I level, the group where it has been established the best correlations between evaluation samples of the force / power and the result of the experiment. From the analysis of the way in which the positive correlations are established between the level of the independent variables measured by us and also the dependent variable, of the result in the sample of 800m, we find out that a series of independent variables, to the values which we identified, correlate better than before the pedagogical experiment, which confirms, once again, the efficiency of power-force training program specific to semi-long-distance female runners.

From the inter-group analysis we find out that there are several independent variables, whose value shows a best correlation with the athletes

performance, at the level of their average: 10 jumps on the strong leg (m), Jumped step on the distance of 100m (nr. of steps); running 300m with high intensity, 30 sec break – decasalt on standing; 20 genuflections with the dumbbell of 50% of the body weight; relative force of thigh extensor muscles and thigh flexor muscles. This confirms the methodical orientation , previously presented and gives us strong arguments in promoting these means of training at this level, in order to develop: the starting-force, acceleration power and power strength, components of specific and integrative physical training of the semi-long-distance female runners , the sample of 800m.

Table 2. The dynamics of the correlation indices during the experiment

Nr. crt.	Evaluation samples	Correlation indication Pearson		
		1 Test (133,18 s.)	2 Test (133,01 s.)	3 Test (129,34 s.)
1	10 jumps on the strong leg (m)	0,71	0,75	0,78
2	Jumped step on the distance of 100m (nr. of steps)	0,40	0,57	0,64
3	Running 300 m with high intensity, break 30 sec – decasalt on standing (m)	0,21	0,57	0,78
4	20 genuflections with the dumbbell of 50% of the body weight (sec)	0,14	0,39	0,64
5	The absolute static force of the legs flexor muscles (kg)	0,07	0,49	0,60
6	The absolute static force of the leg extensor muscles(kg)	0,26	0,52	0,68
7	Relative force of the legs flexor muscles (kg)	0,13	0,73	0,89
8	Relative force of the leg extensor muscles (kg)	0,25	0,57	0,79
9	Relative orce of the thigh extensor muscles (kg)	0,29	0,45	0,68
10	Relative force of the thigh flexor muscles (kg)	0,32	0,43	0,59

Conclusion. The experimental research results have confirmed the rightness of force training, of the teaching strategy used by us at this level of training and the fact that thereby it has greatly contributed to the increase of sports performance in the sample of 800m, from an average of results of 133.18 till 129.34 seconds. The statement is supported by the linear correlations between assessing samples of the specific force / power level ,of the ten samples by which was evaluated both the explosive force, and the thrust power and the power strength.

It was proved that the performance level of the female runners of 800m positively is influenced by the specific force level, at the second level of sports performance, which correlates with the results of preliminary research and confirms theories globally presented in the theoretical and methodological base of the training of this category of athletes.

The content and results of pedagogical experiment confirmed, at the group level, an experience of good practice in terms of methodology of force / muscle power development and these one may methodically constitute purchases for an important aspect of physical training, during the entire annual macro-cycle.

The evaluation samples of the absolute and relative static force demonstrated by athletes at the level of kinematic chains, responsible in achieving effectively the acceleration step and also the step released by semi-long-distance, highlight the progresses achieved at the level of performances average.

All the athletes have optimized their performance in sample and this has been scientifically proved, through statistical determined indicators, especially by the criterion of "t" Student and linear correlations established between the independent variables, handled by the methodology

force and specific power development and also, dependent variable, the result of the sample.

Thus, as a result of the researches, it was demonstrated that it is necessary to rethink and restructure the preparation of the 800 m female runners force / power and this leads to an efficient performance of the competition.

The methodology of training, developed by the authors after the prior researches and applied in the training process of the performance junior semi-long-distance female runners from Romania, has highlighted the effectiveness of methodical ways of the force and force-speed preparation, the very important components of the specific physical preparation, which lead to high performances of the athletics in this sample.

We consider that it is appropriate that the force / power training periodization to be achieved through the customization of the block periodization concept, promoted by V. Issurin [10].

During the entire period of anatomical adaptation phase, we recommend the involvement of all muscle groups, 3-4 workouts / per week. As a working method we propose the circuit method, isokinetic, concentric, slow movements.

In the development phase, general objective must be the increase of the muscle mass, in order to increase the muscle strength involved in the specific effort and its power converting. We recommend that this objective should be achieved through the use of means presented by us (specific movements of the arms as in running, lying extensions / hyperextension of the trunk, lying trunk lifts, lying legs lifts, horizontal knees lifts, legs flexions, squats, the backward standing thrusts; lifts on tips, plyometric exercises with a low impact; exercises with jumps on standing and take-off, special exercises, plyometric mixing exercises / with weights, with and without being heavy, in normal or difficult conditions and not least the running in difficult conditions with and without being heavy).

To achieve the objective we recommend the use of the working method with high and maximum weights about (85-100%), 3-5 executions, 1-4 repetitions in series, 6-10 series in the training; the break between sets – 3-6 minutes, 2-4 workouts per week.

During the power conversion stage, the aim should be the force transformation in specific power: of starting, acceleration and strength, to ensure the physiological base of sports performance in competition, using the working methods: isotonic and plyometric.

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