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COMPETITIVE EXERCISE LOAD AS THE LOCOMOTORY TASKS CRITERION FOR 16 -18 YEAR-OLD MIDLE – DISTANCE FEMALE RUNNERS

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Abstract. *Sports competitions, being the essence of sports, predefine the tasks and orientation of preparing an athlete for effective activity. Only in competitions you can achieve the highest manifestations of speed, strength, endurance, realizing your abilities in results, records, victories. Competitions are the highest culmination of sports activity, serve as a unifying factor of the sports training system. In preparation of athletics sports reserve it is necessary to establish strict compliance of training effects with peculiarities of implemented competitive practice. Only those means and methods of training of girls which are connected with specifics and intensity of competitive wrestling become justified. This fundamental position of the management system of the educational and training process of girls and juniors retains the focus of their training on higher sportsmanship. The studies analyze the load of competitive exercise in 16-18 year old female athletes, specializing in middle distance running.*

Keywords: *athletics, middle-distance runners, training loads, training tasks, HR monitoring, competitive exercise load.*

Introduction

It is considered that the efficiency of the sportsmen training should be evaluated according to the adequacy of training actions resulting to their competitive activity (CA). Only those means and data of training load which optimize psychophysiological presenting of the organism during the contest are recognized as justified ones. However, they should exclude the premature functional physical exertion and the sporting results growth speeded – up[5]. So, the set of implications, their duration, the amount of repetition and the pattern of recovery within the locomotor tasks (LT) and training session fragments should be aligned, in some degree, with the specificity of functional efforts shown during the contests to design the competitive beginnings of coming competitive battle[1, 2, 3].

Methodology and organization of the research

The research aim was to analyze the loads of competitive exercises (CE) for female athletes at the age of 16 – 18 specialized at 800m and 1500 m race. Six women runners took part at the research. Their qualification level was sub-master sportsmen, period of training was 3 – 5 years, the amount of contests analyzed 18 starts. Heart rate (HR) monitoring during running along the distance was affected with monitor “Polar – S610, S810”. HR reactions equal on shifts to the load of CE exercise in 800 - 1500 meter race were

taken into account while programming the locomotor tasks criteria.

The research achievements and their interpretation

Real-time correction during the middle-distance runners training is possible only under the conditions of the permanent correlation of effects applied phenomena with organism CA requirements. One of the most important rate at reactions evaluation is HR[4, 7, 8].There were identified higher HR at 800 m race than at 1500 m race (Table 1–2). It is found that CA at middle-distance runners is fraught predominantly within the high values of heart rate (88-95%), it aims middle-distance runners training load within the specified range of HR.

Table 1. 16 – 18 year old women runners' individual dynamics of the HR at 800 meter race in the different season competitions

Distance runn time	Competitive result, min' sec (speed, m/sec)											
	Winter contest season						Summer contest season					
	2.15,5	**2.17,2**	**2.21,5**	**2.19,3**	**2.19,6**	**2.22,0**	**2.18,3**	**2.16,2**	**2.17,4**	**2.15,9**	**2.14,8**	**2.14,3**
	5,904	***5,831***	***5,654***	***5,743***	***5,731***	***5,634***	***5,784***	***5,874***	***5,822***	***5,887***	***5,935***	***5,957***
Start	134	128	132	144	152	136	136	132	146	128	148	134
0'05"	156	152	156	168	158	148	152	156	142	156	148	156
0'10"	180	181	186	189	188	182	180	176	178	174	177	185
0'15"	188	189	187	188	188	185	187	188	186	183	197	189
0'20"	188	189	187	187	198	185	189	195	188	185	196	191
0'25"	188	191	190	186	188	186	191	195	188	185	195	195
0'30"	188	192	190	187	187	186	191	197	189	189	194	197
0'35"	188	190	190	187	187	185	191	197	189	190	194	197
0'40"	191	193	190	188	187	187	191	199	188	190	194	199
0'45"	197	194	192	189	189	187	191	201	187	190	195	201
0'50"	197	191	192	188	191	191	191	200	187	191	196	200
0'55"	198	194	193	188	191	189	191	200	185	191	199	200
1'00"	199	192	193	189	193	190	192	201	194	190	198	201
1'05"	199	195	193	189	194	191	192	202	193	191	198	202
1'10"	200	194	193	189	194	192	193	203	193	191	198	203
1'15"	200	198	193	189	194	193	194	204	194	192	197	204
1'20"	200	196	193	189	195	193	195	203	195	193	197	203
1'25"	200	196	192	189	196	195	195	204	195	195	197	204
1'30"	200	197	192	191	199	196	196	205	191	195	194	205
1'35"	200	197	194	193	198	196	199	203	191	196	194	203
1'40"	200	198	195	196	198	197	198	205	192	199	195	205
1'45"	200	199	193	196	198	197	198	205	199	203	196	205
1'50"	203	201	193	197	199	196	200	205	198	203	199	206
1'55"	206	201	194	197	199	196	201	206	198	203	202	207
2'00"	206	203	194	199	199	197	201	206	199	203	203	207
2'05"	208	203	195	201	200	195	202	205	199	204	205	208
2'10"	211	205	195	203	200	195	202	204	200	204	205	209
2'15"	211	205	196	203	201	195	203	204	200	205	207	209
2'20"	212	206	197	203	202	196	204	203	201	205	209	211
Finish	***211***	***205***	***197***	***203***	***202***	***195***	***203***	***203***	***201***	***205***	***207***	***209***
30 sec	***183***	***185***	***179***	***177***	***175***	***179***	***183***	***186***	***181***	***187***	***187***	***186***
1 min	***174***	***172***	***167***	***167***	***166***	***169***	***174***	***177***	***173***	***179***	***177***	***179***
∑3-x П	***94,7***	***93,7***	***90,5***	***91,2***	***90,5***	***90,5***	***93,3***	***94,3***	***92,5***	***95,2***	***95,2***	***95,7***

Table 2. 16-18 year old women runners' individual dynamics of the HR at 1500 m race in the different season competitions

Distance running time	Competitive result, min' sec (speed, m/sec)											
	Winter contest season				Summer contest season							
	4.57,0	**4.55,6**	**4.49,9**	**5.03,5**	**4.49,3**	**4.50,2**	**4.41,6**	**4.39,2**	**4.45,0**	**4.42,5**	**4.37,8**	**4.35,5**
	5,051	***5,074***	***5,174***	***4,942***	***5,184***	***5,169***	***5,326***	***5,372***	***5,263***	***5,310***	***5,399***	***5,445***
Start	136	132	144	152	136	136	132	146	128	148	134	146
0'10"	152	148	156	174	158	148	152	156	142	156	148	156
0'20"	188	186	189	188	182	180	176	178	174	177	185	187
0'30"	191	194	189	199	188	186	185	187	186	196	189	188
0'40"	191	193	189	201	189	187	187	185	191	195	191	189
0'50"	192	193	188	204	187	188	187	186	191	194	191	190
1'00"	191	191	188	202	186	189	188	187	190	194	191	190
1'10"	189	191	187	202	188	189	188	187	190	194	191	190
1'20"	189	189	186	202	188	189	189	187	189	195	191	191
1'30"	188	189	186	186	189	190	189	189	189	196	191	191
1'40"	188	189	185	186	189	192	188	188	188	199	191	190
1'50"	189	189	187	186	189	193	188	189	189	198	192	191
2'00"	188	189	187	186	188	192	187	188	189	198	192	191
2'10"	188	189	190	187	188	194	187	188	188	198	193	192
2'20"	186	189	190	184	187	194	186	189	189	197	194	193
2'30"	187	189	190	184	187	194	187	189	191	197	195	195
2'40"	186	190	190	186	188	193	187	189	191	197	195	195
2'50"	186	190	192	187	188	192	189	189	192	196	196	196
3'00"	186	191	192	188	187	192	191	189	193	198	199	199
3'10"	189	193	193	188	190	190	191	189	194	196	198	203
3'20"	190	193	193	188	195	190	192	194	193	196	198	204
3'30"	190	194	193	185	194	191	191	194	191	198	202	205
3'40"	191	195	193	183	194	191	193	195	191	198	201	205
3'50"	191	193	193	185	193	191	193	195	191	198	201	204
4'00"	191	193	193	185	193	191	193	195	193	198	201	203
4'10"	190	193	193	185	193	191	193	196	192	198	200	203
4'20"	190	193	193	185	193	191	194	196	192	198	200	204
4'30"	190	193	193	185	193	191	194	196	193	198	201	204
4'40"	190	193	193	185	193	191	194	196	194	198	201	204
4'50"	190	193	193	185	193	191	194	196	195	198	202	204
5'00"	191	193	193	185	193	191	194	196	195	198	201	204
Finish	***191***	***193***	***193***	***185***	***193***	***191***	***194***	***196***	***195***	***198***	***201***	***204***
30 sec	***179***	***181***	***182***	***179***	***183***	***181***	***185***	***185***	***183***	***186***	***187***	***187***
1 min	***167***	***169***	***167***	***164***	***173***	***173***	***175***	***177***	***173***	***179***	***177***	***179***
∑3-x II	***89,5***	***90,5***	***90,3***	***88,0***	***91,5***	***90,8***	***92,3***	***93,0***	***91,8***	***93,8***	***94,2***	***95,0***

Training loads classification used in practice and recommended for cyclic sports requires their differentiation according to readily available integrated index – HR (heart beat/cardiac impulse/min) [4, 7, 8].

Low-intensity loads (the first zone, HR < 135 hb/min) do not have considerable training effect. Training effect within the average intensity zone (the second zone, HR=136-160 hb/min is achieved in the long-term course of the work (aerobic power supply mechanism). The loads of aerobic – anaerobic power supply mechanism are divided into two zones. The LT having the lower bound of Anaerobic

Threshold (ATh) girls 85-86% out of individual maximum are carried out within the high intensity zone (HR=161-180 h/min), O_2absorption is 70-80% out of Maximum Oxygen Consumption (MOC), blood lactate is 4-7 mMole/l. The loads of this zone allow improving cardiorespiratory system capacity and raise the aerobic performance of an organism. The LT within the fourth zone of the great intensity initiate the HR deviance nearly the critical one (HR > 181 hb/min). O_2absorption is 90-100% mMole/l out of MOC. This zone is characterized by significant concentration of lactic acid up to 10-12 mMole/l. It is exerted the training effect on MOC as well as anaerobic performance of an organism. The loads, overcritical on their intensity, are placed into the zone of maximal value. Adjusted for duration the LT can be alactic (up to 40 sec) and glycolytic (up to 2,5 min). Depending on speed and exposure time the HR is 185-200 /min and it does not have linear correlation with O_2 intake.

Considering burdensomeness of LT execution regulation, the available technologies of the body responses to action monitoring, the unified and experts perceived classification of training loads based on HR recording at recuperation period after work has been set up and tested during this research.

It is suggested using the rate of "3 impulse amount" as a load differentiation criterion. The required parameter has been calculated as HR valuated amount within three temporal spans of recuperation period:

- HR at the time of the end of exercises (hand calculation for 1-10 sec of recuperation
- HR at 30 sec after the end of exercises (hand calculation for 30 sec of recuperation)
- HR at 1 min after the end of exercises (hand calculation for 50-60 sec of recuperation)

The research data allowed putting in order LT according to their zones of intensity through the criterion noted:

- competitive load zone: HR 90,1 hb>;
- close-emulative load zone: HR 85,1-90;
- stabilizing (glycolytic) load zone: HR 80,1-85 hb;
- developing (mixed) load zone: HR 75,1-80 hb;
- supporting (aerobic) load zone: HR 70,1-75 hb;
- recuperating load zone: HR 65-70 hb.

It is worth pointing out that the classification developed can maintain continuity despite runners' qualification. At the same time, it has high predictive significance. For example, correlation coefficient between running speed at 800m race and "3 pulse amount" was r=0,955 (P< 0,001), between running speed at 1500m and the criterion noted "3 pulse amount" – r = 0,961 (P< 0,001).

Model-aimed experiment having the LT which are adequate to cardiovascular system responsiveness functional load competitive exercises (CE) (800 and 1500m) was held during the pre-contest prep of female athletes in experimental group. The data obtained allowed to connect different training programs to the load CE [1, 2, 3, 6].

Comparing LT with different integration of effect parameters, it should be noted that during the task 10x100x100 m at a speed of 80% out of maximum the work within the high intensity zone was 19.4%, within the great intensity zone was 41,2%. The same LT but realized at a speed of 90-95% out of maximum was done at 31,2% within the maximum and high intensity zone, and at 26% within the great intensity zone. The CE load and LT effect comparison shows that the main influencing factor is the exercising intensity. The proper data of functional performance were not reached at the LT10x200x200 m again at the same time the developments within the high data (IV) were 19,7%, within the great data (III) they were 31,5%. 100-200 m work as well as 2-22 km work does not call the state in the female athletes' organisms identical CE at 800-1500 m race.

Near competitive run effect on the runners' organisms there were LT using the distance from 300 to 1000 m, moreover, the 400-600 m distance run at a speed of higher than medium speed of CE. For instance, during the task 10x300x300 m the work within the high intensity zone (IV) was 40,2%, within the great intensity zone (III) – 51,6%. During the task 15x300x300 m the work within the maximum and high intensity zones was 31,9% and within the great intensity zone was 16,8%. Obviously, higher reps than optimum blunt the effectiveness of training effects since the LT run mode swaps for mixed and aerobic ones.

During the LT 8x400x400 m with the ordinary pause of gallop walk the working capacity within the high data zone (IV) was 21,6%, the great data zone (III) -14,4%. During the LT 10x400x400 m with the strict span of slow run the work within the high intensity (IV) was 41,2%, within the great intensity (III) was 47,1% that is typical for functional response at 300m distance running. At the same time the recovery period varying, for example, its decrease according to the plan causes, to a high degree, developments specific for CE load at 800 and 1500m race, but it is not enough for perfect matching to organism functional intension at the competitions.

Distance shortening, that is LT 800+600+500+400+300 m, has become appropriate and required the stepped-up pace of LT performing. The changes have been expressed in the following parameters: the work within the high intensity zone was 35,8%, within the great intensity zone it was 47,9%. The best possible requirements to CA of the middle-distance female runners include functional reactions taken notice of LT 6x500x500 m. Performing this task at a speed close to competitive with the optimal number of repetitions and prescriptive rest pauses has given the possibility to achieve the following work capacity rates: within the high HR zone (IV) – 43,3%, within the great HR zone (III) – 55,1%.

The speed of running in LT 5x1000x800 m differed along the distance. The distance running time was in average 4.30 min in the first case and 3.45 in the second case. The functional responses of cardiovascular system happened to be different to physical activity task offered. The work within the high intensity zone (IV) was 27.7% in the first case, within the great intensity (III) it was 38,1%. The work within the high intensity zone (IV) was 53,1% and within the great intensity (III) was 34,4% in the second case. Cross training at 5-22 km distance is performed within the great intensity (III) HR=16-17 hb/min.

Thus, the female runners' work at 10x300 m distance (3-4 min pause), 10x400 m (4 min span), 6x500 m (5 min span) at a speed of 6-10% higher than competitive one and at 5x1000 m distance (5-6 min span) at a speed of 93-95% higher than competitive one, the fullest extent is in keeping with CE load by impact. Heart rate and lactic acid concentration are 94-98% out of rate registered at the contests. Overcoming 2x2000 m race (6-8 min span) and single shot running at 3000m distance at a speed of 70,77, 86% out of competitive speed does not lead to functional and biochemical changes typical of the middle-distance race. Special aspects of the running LT mentioned above must be taken into account in the design of preparation and competitive periods of the middle-distance female runners training.

Conclusion

It should be noted that the performance targets of intensity at working capacity specific to competitive running at 800 and 1500 m race (IV – 88–95%) have not been achieved in any of the LT. That stands to reason. If only CA data documented at the competition, then besides the exercise duration and intensity, prescriptive rest was an important influencing factor. Peculiarity is that automatic work analysis according to intensity zone offered by «PolarPrecisionPerformance 4,0» program includes rest pauses as well that

generally causes the decrease of work quantitative data at the intensity zones.

In our opinion, it must be admitted that the training load control on the criterion of "3 impulse sum" is more efficient. According to classification offered competitive running finishes with HR (90-95 hb). At the same time any of the LT to be evaluated in the classification offered can simulate the effect produced in an organism accurately or be connected to competitive exercise load data. This approach sizing up LT impact on middle distance female runners' organisms is more effective. Proposed grading system of training actions may seem disputable, judgements may be polemical, thereby necessary adjustments and further experimental verification will be required in days to come.

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