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INFLUENCE OF DIFFERENT TRAINING MODELS ON DEVIATION OF SPEED OF RUNNING FROM THE MEAN

Original scientific paper

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Abstract

Topic of this experimental research is related to defining the influence of two training models on standard deviation of running speed from the mean in 1500m running when the athlete is running "on the set result" and "on the best result". The aim of the study was to achieve higher quality of teaching athletics as a university subject by evaluation of optimum components of load for students in long distance running, that is, to determine manifestations of the two training models on deviation of running speed from the mean in 1500m running when the athlete is running "on the set result" and "on the best result". Results of the research show that both experimental groups of examinees had their results from morphological (MFR index) and functional space (Astrand test) improved. Sample of examinees consisted of students of Faculty of Sport and Physical Education, University of Belgrade, who volunteered for conducting the experimental procedure. Total number of examinees on the initial and final measurements was N=43. The examinees were 21-22 aged male students with medium training fitness level. Two experimental groups were formed out of the sample. The first experimental group (G1) used the training model where the examinees did not get information about lap time on every 400m of running but after they had run the whole distance. Pulse values were measured after the distance had been run. The other experimental group (G2) used the training model where the examinees got information about lap time and pulse values on every 400m of running.

Keywords: *students, teaching athletics, training model, long-distance running*

INTRODUCTION

In order to understand the essence of this research it is necessary to understand the problematics of tempo tactics (speed) on middle and long-distance tracks. In all athletic running disciplines, from middle to the longest distances, lower speed of a race favors runners with good finish. Runners who run among the first have bigger air resistance and consequently spend more energy than those who run directly behind them.

From the historical point of view, athletes who compete on, for example, 800m and 1500m are the world-class athletes with a good chance to win a medal in one or both races. The English runner Sebastian Coe is an example of this kind. However, the athletes are not expected to take part in both races if that would endanger winning a medal in one of the races. Due to these reasons, if an athlete plans to participate in both races, he/she must be ready to take part six times during the Olympic Games and to recover enough between the races (Coe, 1988).

Running tactically "smart" race can be a decisive factor in (not) achieving the goals in the race. Corresponding strategy begins with a choice of proper pacing. There is a large number of pacing strategies and each of them has its advantages and disadvantages.

Constant pace running is one of the most popular strategies and it is characterized by minimum number of changes of running pace during the whole race. This is one of the best strategies in running a marathon.

Constant load running is based on the choice of pacing on the basis of subjective assessment of fatigue. A runner tries to run at the same level of subjectively assessed fatigue with running pace decreases during the race. This strategy enables finish without too big fatigue, but it impedes optimal result and it is suitable for the beginners.

On one hand, students are educated for middle and long-distance running (this methodological unit is planned in the Faculty's curriculum) in a contemporary way, while on the other hand, better results could be achieved if they are taught to use the optimum tempo of running and eventually to pass on that experience to younger generations (Enoksen, Tjelta & Tjelta, 2011). 1500m running belongs to the athletic discipline of running where middle distances pass to the category of long distances. Some sports science researchers confirmed the effects of aerobic training for thousands of members of the Air forces by test of running on 1500m.

The road of achieving the best result in running on 1500m has all the elements of a scientific approach in solving this problem. The initial definition of maximum oxygen consumption, definition of interval of how long a runner will be in the aerobic zone of work during running on a training or on the competition, are important elements influencing the final result.

For years there have been no criteria which would help the assessment of Faculty of sport and physical education students on 1500m running more efficiently (Stefanovic & Stefanovic, 2015). It is not only the educational process, but also a possibility for those students, who will become university professors later, to pass their knowledge on their students, future sportspeople, efficiently.

Running tempo is in tough correlation with running strategy in the race. Preparation for every competition in every sport consists also of a strategic plan in order to provide as good ranking as possible, which is victory.

METHODS

Subject of the research was defined on the basis of hypothetical attitudes to the problem of the research as well as on basic theories and results. The subject of this research refers to definition of the influence of two training models on standard deviation of speed of running from the mean in 1500m running when the athlete is running "on the set result" and "on the best result".

The aim of the research is to achieve higher quality of teaching athletics as a university subject by evaluation of optimum components of load for students in long distance running. In this research, it concretely refers to the task to determine manifestations of the two training models on deviation of speed of running from the mean in 1500m running when the athlete is running "on the set result" and when the athlete is running "on the best result".

For realization of the aim of the research it was necessary to conduct the following research tasks:

• Define how the training model, where the examinees do not use information about lap time and the pulse while running, will influence standard deviation of running speed from the mean in 1500m running when the athlete is running "on the set result";

• Define how the training model, where the examinees use information about lap time and the pulse while running, will influence standard deviation of running speed from the mean in 1500m running when the athlete is running "on the set result";

• Define how the training model, where the examinees do not use information about lap time and the pulse while running, will influence standard deviation of running speed from the mean in 1500m running when the athlete is running "on the best result";

• Define how the training model, where the examinees use information about lap time and the pulse while running, will influence standard deviation of running speed from the mean in 1500m running when the athlete is running "on the best result";

• Define average speed of running on 1500m on final measurement when the athlete is running "on the set result"; and

• Define average speed of running on 1500m on final measurement when the athlete is running "on the best result".

Hypotheses

The following two hypotheses are set in accordance with the problem, the subject, research surveys conducted so far and the aim of the research:

H1 – Training model where examinees use information about lap time and the pulse while running, will significantly influence small oscillations of standard deviation of speed of running from the mean on 1500m distance when the athlete is running "on the set result" in comparison with the training model where examinees will not use information about lap time and the pulse.

H2 – Training model where examinees use information about lap time and the pulse while running, will significantly influence small oscillations of standard deviation of speed of running from the mean on 1500m distance when the athlete is running "on the best result" in comparison with the training model where examinees will not use information about lap time and the pulse.

Method of work

Experimental longitudinal method, method of theoretic analysis, comparative method, descriptive method and statistical method were used in the research.

Sample of examinees consisted of students of Faculty of Sport and Physical Education, University of Belgrade, who volunteered for conducting the experimental procedure. Total number of examinees on the initial and final measurements was N=43. The examinees were 21-22 male students of the medium training fitness.

Two experimental groups were formed out of the sample. The first experimental group (G1) used the training model where the examinees did not get information about lap time on every 400m of running but after they had run the whole distance. Pulse values were measured after the distance had been run. The other experimental group (G2) used the training model where the examinees got information about lap time and pulse values on every 400m of running.

Sample of variables

Sample of variables consisted of criterion and predictor variables. Criterion variable: Deviation (average change) of speed of running at 1500m distance and the predictor variable: Morphological space.

Anthropometric dimensions were measured directly for MFR-index definition. They are presented in Table 1.

Table 1. Anthropometric variables with units of measurement and codes.

No.	Variables	Unit of measurement	Code
1	Body height	cm	TV
2	Body mass	gr	TM
3	Upper-arm circumference	cm	Onl
4	Forearm circumference	cm	Opl
5	Thigh circumference	cm	Onk
6	Lower leg circumference	cm	Opk
7	Upper-arm skin thickness	cm	DKNNl
8	Forearm skin thickness	cm	DKNPl
9	Thigh skin thickness	cm	DKNNk
10	Lower leg skin thickness	cm	DKNPk
11	Chest skin thickness	cm	DKNGr
12	Stomach skin thickness	cm	DKNT

Functional space was determined using following variables:

- Maximum oxygen consumption (V02 max)
- 1500m running pulse (beats / min).

Anthropologic space was determined using following variables:

- Average running speed on 1500m (Vm/s).
- Lap time on 400 m (ts).

Description of the research

The following training programme, with interval training method, was planned for conducting this experiment (Dick, 1980a; 1980b; Fletcher, 1995; Carter, Jones, & Doust, 1999; Tončev, 2001; Bolas, 2004; Stefanović & Stefanović, 2002; Stefanović, Juhas, & Janković, 2008; Stefanović, Jakovljević, & Janković, 2010; Stefanović, 2012).

Class 1 – Definition of maximum oxygen consumption by Astrand test (initial measuring)
Class 2 – Running 1500 m (initial measuring)
Class 3 – Running 6 x 400 m
Class 4 – Running 3 x 800 m
Class 5 – Running 2 x 1200 m
Class 6 – Running 6 x 400 m
Class 7 – Running 3x 800 m
Class 8 – Running 2 x 1200 m
Class 9 – Running 6 x 400 m
Class 10 – Running 3x 800 m
Class 11 – Running 2 x 1200 m
Class 12 – Running 6 x 400 m
Class 13 – Running 3x 800 m
Class 14 – Running 2 x 1200 m
Class 15 – Running 1500 m (final measuring – running on "the set result")
Class 16 – Running 1500 m (final measuring - running on "the best result")
Class 17 – Definition of maximum oxygen consumption by Astrand test (final measuring)

Statistical analyses

The results obtained after the experiment were processed statistically by descriptive and comparative statistics. Representative measures of average values and standard deviations were used from the area of descriptive statistics. In order to define the effects of training

on the examined variables, variance analysis with repeated measuring (initial and final) in relation to two groups of examinees (G1 and G2) was used – combined variance analysis – Mixed ANOVA.

If there was significant influence of interaction between time and the group, then the subsequent analysis of simple training influences (time) for each group separately was performed. Definition of differences between different levels of one factor was realized on the basis of Bonferroni post-hoc analysis. Effect of statistical significance was defined at the p value level which is ≤0,05.

Anthropometric and morphological variables were mutually compared between different groups on initial measuring by using T-test for independent samples in order to determine if there are any differences between the two experimental groups.

RESULTS AND DISCUSSION

Average values of anthropometric indicators for two groups of examinees, on the initial measuring are presented in Table 2.

T-test for independent samples where the difference in anthropometric variables between the two groups of examinees on the initial measuring was calculated. Results are presented in Table 3.

On the basis of the obtained results, it can be said that there is no difference between the groups in these variables what shows that the experimental groups did not differ at the initial measuring on these criteria. It should be emphasized that the examinees did not have the possibility of large influence on explosive strength development because the coefficient of it being innate was 0,80% in our research exercises (Mekić, Aleksić & Toskić, 2014).

Table 2 – Average values of anthropometric indicators for two groups of examinees at the initial measuring.

GROUP		N	Mean	Std.Deviation	Std.ErrorMean
TVinit.	1	19	184.442	6.1149	1.4029
	2	24	181.263	7.3382	1.4979
TM_init.	1	19	79.232	8.4998	1.9500
	2	24	75.583	8.7373	1.7835
ONl_init.	1	19	30.774	2.4763	.5681
	2	24	29.938	1.8743	.3826
Opl_init.	1	19	27.179	1.2682	.2910
	2	24	27.425	1.5292	.3121
Onk_init.	1	19	58.674	4.0028	.9183
	2	24	57.537	3.6979	.7548
Opk_inic.	1	19	38.589	2.8266	.6485
	2	24	38.121	2.8350	.5787
DKN Nl_init.	1	19	3.995	1.0834	.2486
	2	24	4.029	1.3601	.2776
DKN Pl_init.	1	19	4.689	1.5979	.3666
	2	24	4.867	1.4681	.2997
DKN Nk_init.	1	19	15.074	5.7738	1.3246
	2	24	13.004	5.3353	1.0891
DKN Pk_init.	1	19	8.884	3.2279	.7405
	2	24	8.288	3.5191	.7183
DKN Gr_init.	1	19	7.389	3.7489	.8601
	2	24	6.525	2.6854	.5482
DKN Tr_init.	1	19	15.047	9.5442	2.1896
	2	24	13.079	8.0508	1.6434

Table 3 – T test results for independent samples where difference in anthropometric variables between the two groups of examinees was detected at the initial measuring

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std.Error Difference	Lower	Upper
TVinit.	Equal variances assumed	.359	.553	1.516	41	.137	3.1796	2.0968	-1.0550	7.4142
TM_init.	Equal variances assumed	.000	.994	1.376	41	.176	3.6482	2.6513	-1.7061	9.0026
ONl_init.	Equal variances assumed	.959	.333	1.261	41	.214	.8362	.6631	-.5030	2.1753
Opl_init.	Equal variances assumed	.572	.454	-.564	41	.576	-.2461	.4362	-1.1270	.6349
Onk_init.	Equal variances assumed	.223	.639	.965	41	.340	1.1362	1.1776	-1.2420	3.5143
Opk_init.	Equal variances assumed	.047	.829	.539	41	.593	.4686	.8695	-1.2873	2.2245
DKN Nl_init.	Equal variances assumed	.773	.384	-.090	41	.929	-.0344	.3827	-.8073	.7384
DKN Pl_init.	Equal variances assumed	.003	.958	378	41	.707	-.1772	.4687	-1.1238	.7694
DKN Nk_init.	Equal variances assumed	.024	.879	1.218	41	.230	2.0695	1.6988	-1.3613	5.5003
DKN Pk_init.	Equal variances assumed	.371	.546	.572	41	.570	.5962	1.0423	-1.5088	2.7012
DKN Gr_init.	Equal variances assumed	.503	.482	.881	41	.384	.8645	.9815	-1.1177	2.8466
DKN Tr_init.	Equal variances assumed	1.120	.296	.734	41	.467	1.9682	2.6832	-3.4507	7.3871

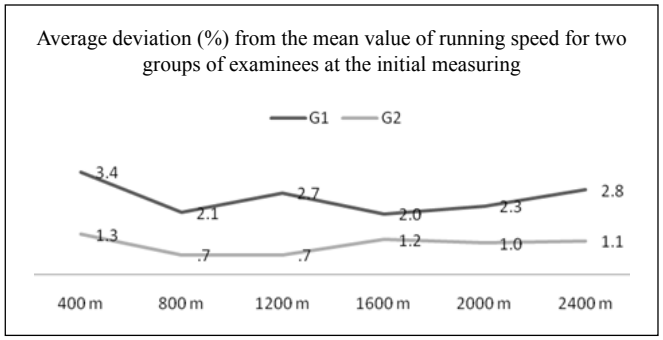

Diagram 1. Deviation from the mean value of running on 1500m at the initial measuring in percentages.

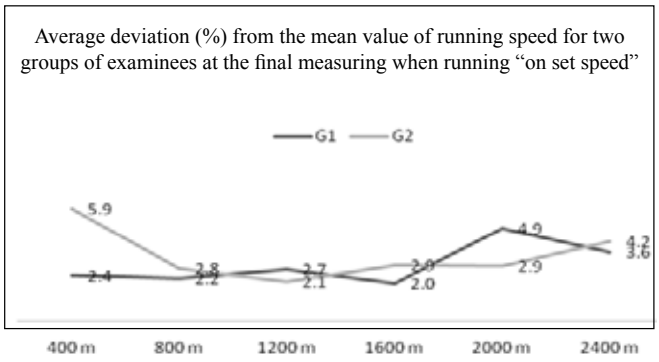

Diagram 2. Deviation from the mean value of running on "the set result" on 1500m at the final measuring in percentages.

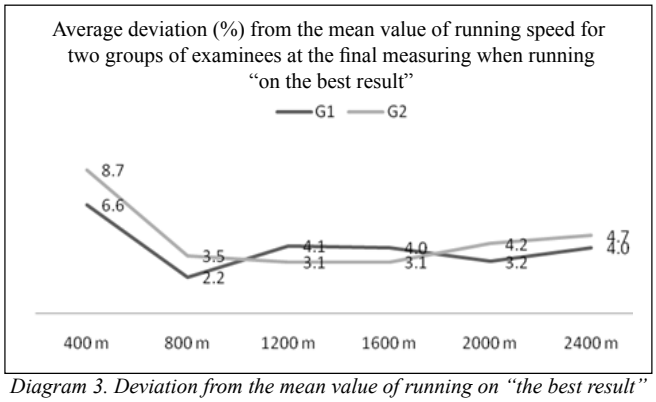

Diagram 3. Deviation from the mean value of running on "the best result" on 1500m at the final measuring in percentages.

Diagram 1 gives graphical presentation of deviation from the mean value of running on 1500m at the initial measuring in percentages.

Diagram 2 presents the deviation from the mean value of running on "the set result" on 1500m at the final measuring in percentages.

Diagram 3 presents deviation from the mean value of running on "the best result" on 1500m at the final measuring in percentages.

In order to have better insight into the problematics of this study, values of the average deviation of the mean value of running speed on 1500m race at the initial measuring for the two groups of examinees (G1 and G2) are presented in the graphs.

CONCLUSIONS

After the conducted experimental work, the results of the research showed the following:

Training model where the examinees did not get information about leap time on every 400m, but after the run distance and where the pulse values were measured after the run distance did not have any significant effect on decrease of variability of deviation of running speed on 1500m when the race was "running on the set result" (speed) for the first experimental group.

Training model where the examinees did not get information about leap time on every 400m, but after the run distance and where the pulse values were measured after the run distance did not have any significant effect on decrease of variability of deviation of running speed on 1500m when the race was "running on the best result" (speed) for the first experimental group.

Training model where the examinees got information about leap time on every 400m and about the pulse values did not have any significant effect on decrease of variability of deviation of running speed on 1500m when the race was "running on the set result" (speed) for the second experimental group.

Training model where the examinees got information about leap time on every 400m did not have any significant effect on decrease of variability of deviation of running speed on 1500m when the race was "running on the best result" (speed) for the second experimental group.

On the basis of the previously presented results, it can be said that the first and the second hypotheses were not confirmed. The hypothesis is that the examined hypotheses were not confirmed due to the motivation factor (more than 70 km were run during the experiment) or perhaps because the examinees were not top athletes who have larger set of trainings and competition experience on these distances.

Both experimental groups of examinees improved their results from the areas of morphological (MFR index) and functional space (Astrand test).

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