



## ADAPTATION CHANGES IN THE DYNAMICS OF THE PULSE RATE UNDER THE INFLUENCE OF THE TRAINING METHODS

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### ABSTRACT

**Introduction:** In sports science, there are a number of well-known observations, studies, and experiments on the behavior of the pulse rate during training loads of different nature. **Methods:** We are intrigued by the specific adaptation responses within sports that are triggered through the application of varied running loads, focusing on the interplay between distance run/total volume and running speed/intensity. **Results:** We established change in the pulse rate and has been defined the evaluation of cardiovascular performance, by means of a broad arsenal of tests. **Discussion:** we applying direct measuring of the body metabolism and energetics. **Conclusion:** Organizing training impacts in intervals increases the adaptive retention of specific power capabilities.

**Key words:** running loads, adaptation mechanisms, a training process, author's methodology.

### INTRODUCTION

Sport is one of the most integrative fields for studying the processes of adaptation in the human body (1, 2). Adaptation in the context of sports activity is a fundamental category that governs athletic development (3, 4). Physical education and sports in higher education play a significant role in helping individuals adapt and mitigate negative psychological and physical processes through systematic and active physical activity (5). The rapid changes occurring in the environment in which individuals reside, regardless of their intentions, constantly expose them to new situations and demands for adaptation (6-9). Numerous authors have discussed the positive impact of sports on individuals' health and have extensively analysed this subject (10-14). Undoubtedly, this ongoing race against time intensifies feelings of anxiety

and concern in individuals, who must navigate a multitude of alternatives and make choices in order to effectively manage dynamic conditions (15).

### METHODS

We are intrigued by the specific adaptation responses within sports that are triggered through the application of varied running loads, focusing on the interplay between distance run/total volume and running speed/intensity. To ascertain the presence of a meaningful correlation between these parameters of running loads that could lead to adaptive changes, we undertook a targeted investigation.

**Aim:** We studying the delineation of key parameters within the training regimen through statistical analysis, including: • Workout duration in minutes • Average running speed • Average pulse rate during training sessions • Minimum and maximum pulse rates • Standard deviation from the mean pulse rate.

**The study subject** is the adaptation processes of athletes to the demands of endurance running.

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**The study object** is the changes in the adaptive capabilities of athletes and their development in the educational-sports process under the influence of running loads.

**The study contingent** consists of 87 athletes, including 37 middle-distance runners and 50 football players.

**Procedures:** In connection with the aim and the tasks of this study, we classified three main varieties within the organization of the running loads on the basis of the method of continuous efforts and the method of repeated working and recovery stages on which the study was to be carried out:

- Continuous and even-pace 8 - km running in aerobic mode of energy supply at 70 % of the maximum individual capabilities, which could theoretically produce up to 2 mill moles lactate.
- Interval running in an aerobic-anaerobic mode of energy supply at 90-93% of the maximum speed for the corresponding distance with shorter rest periods – 10 x 100

m hill running through 100 m slow running and 4 minutes between the sections.

- Intensity repeated running in anaerobic-aerobic and glycolytic mode of energy supply with more than 93% speed of the maximum capabilities with fewer numbers of repetitions and combined shorter and longer rest periods 1 x 2000 m + 1 x 1000 m with an 8-minute pause in between+ 3 x 3000 m with a 10- minute pause.

**Statistics**

The obtained research results underwent mathematical and statistical processing using MATLAB – a methodology adapted for sports-pedagogical research according to Hadzhiev, N., Brogli, Y., Zelyazkov, T. 1973, Brogli, Y. 1977, and 1979.

**RESULTS**

The values of the main parameters/running speed, pulse rate: maximum, minimum, average and standard deviation. The results (**Table 1**) shown represent the content and the functional effect of three training activities differing in their internal organisation of the loads.

**Table 1.** Registered results for the content and the functional effect of three training activities differing in their internal organisation of the loads

Training Content	Training Characteristics	T	$\bar{V}$	P	P	-	S
		(min)	(m/sec)	Max	Min		
8000 m	Continuous Running	46	3,63	192	98	163	19,7
10 x 100 m Hill running Every 100 m in three sections	Interval Running	63	6,26	180	102	144	15,5
2000 m + 1000 m Every 8 min + 3x300 m Every 10 min.	Repeated running	62	5,50	198	105	144	26,2

**Legend:** V – average speed; P – average pulse rate; S – standard deviation; t – total time duration of the training; P.max – maximum pulse rate; P.min – minimum pulse rate

The comparative analysis explains some basic phenomena of the adaptation process. The analysis is as follows:

- The continuous method of loading stimulates the heart-muscle work at a high level for a long time. An index is the average pulse rate of 163 beats per minute, while it is 144 beats

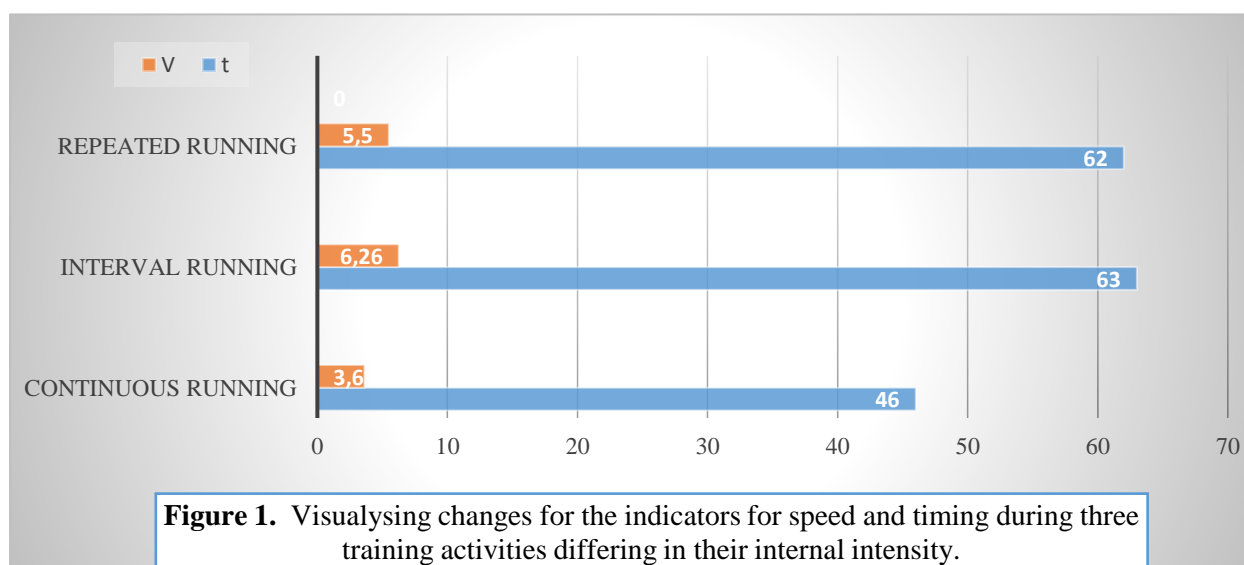
per minute when using the other two methods.

- The interval running of 100-metre strides uphill has a combined impact, which relates to the specific performance of the peripheral factor to provoke more precisely the power capability of the big muscle groups. In spite

of the comparatively low average pulse rate of 144 beats per minute and maximum pulse rate of 188 beats per minute, this type of load sustains a constant level of the heart muscle work. The index is the standard deviation – 15,5 was the least in these three cases.

- With the training combined with repeated strides, the main dominant of the adaptation process is caused by active participation of
- anaerobic mechanisms of energy supply. In this case, the functional effect on the increase

in the adaptive capabilities is comparatively little. The average pulse rate is 144 beats per minute, the maximum pulse rate is 198 beats per minute, and the standard deviation is 26.2. This is to show that similar training impacts build up soaring increases of the pulse rate and abrupt changes in the homeostasis of the organism under the influence of anaerobic mechanisms.



## DISCUSSION

This report is part of a doctoral dissertation aimed at conferring the academic degree - Doctor of Sciences. We conducted an extensive study spanning several years to elucidate the thesis on cardio adaptation. A small portion is presented in the current report. Adaptation encompasses a broad conceptual content. We analyse the patterns in the development of specialised running endurance based on a series of original research studies and applied experiments during the training of middle-distance runners and football players with intermediate qualifications. This paper discusses changes and the underlying causes for the adaptive reactions as a result of the continuous application of specific methods influencing cardiac muscle stabilisation. For a long time, the pulse rate has been defined as a classic criterion of evaluation of cardiovascular performance. In this way, by means of a broad arsenal of tests and modern facilities for directly measuring the body metabolism and energetics.

## CONCLUSION

The study results thus obtained, and the analysis carried out give us reason to draw the following

1. The continuous method leads to adaptive responses in both short and long terms, involving the stabilisation of the cardiac muscle and enhancement of the aerobic system for energy production.
2. Organizing training impacts in intervals increases the adaptive retention of specific power capabilities, particularly when there is an alternating utilisation of aerobic and anaerobic energy supply mechanisms.
3. Repeated training through running segments triggers the mobilisation of anaerobic energy supply mechanisms and results in adaptive effects, primarily influencing the motor system with a strong emphasis on supporting anaerobic mechanisms.

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