Revista Românească pentru Educație Multidimensională
ISSN: 2066-7329 | e-ISSN: 2067-9270
Covered in: Web of Science (WOS); EBSCO; ERIH+; Google Scholar; Index Copernicus; Ideas RePeC; Econpapers; Socionet; CEEOL; Ulrich ProQuest; Cabell, Journalseek; Scipio; Philpapers; SHERPA/RoMEO repositories; KVK; WorldCat; CrossRef; CrossCheck

2024, Volume 16, Issue 2, pages: 356-375 | https://doi.org/10.18662/rrem/16.2/861
Submitted: March 18th, 2024| *Accepted for publication:* March 28th, 2024

Characterization of the Specificity, Motricity and Complexity of Half-Distance and Long-Distance Training

Gabriela SZABO [1]

[1] „George Emil Palade" University of Medicine, Pharmacy, Sciences and Technology of Târgu Mureş, Romania
gabriela_szabo75@yahoo.com

Abstract: *The present study starts from the conviction that no performance of value can be achieved without a precise knowledge of the requirements and ways of directing sports training for each sports discipline; that there can be no performance without a technique as close to perfection as possible, and that there can be no perfect technique without a well-developed potential for the development of motor capacities, and these requirements of training cannot be fruitful if the creative thinking of the coach does not apply the most appropriate tactic for the moment or the situation in the competition. This study, based on personal experience and the analysis of data collected during training sessions, aims to highlight the specific aspects and complexity of training in long-distance and half-distance sports, which must be thought, designed and implemented on a scientific basis, being adapted to physiological and environmental conditions, without neglecting the psychological and context component.*

Keywords: *motricity; athletics; half-distance training; long-distance training; altitude training.*

How to cite: Szabo, G. (2024). Characterization of the specificity, motricity and complexity of half-distance and long-distance training. *Revista Românească pentru Educație Multidimensională, 16*(2), 356-375. https://doi.org/10.18662/rrem/16.2/861

©2024 Published by LUMEN Publishing. This is an open access article under the CC BY-NC-ND license http://creativecommons.org/licenses/by-nc-nd/4.0/

Introduction

The purpose of this article is to bring more knowledge specific to both the field of physical education and sports and, above all, national and international athletics, in terms of training. The article summarizes the personal experience accumulated over the years as a World and European Olympic Champion in athletics. The scientific knowledge related to the technique, the periodization and the means of sports performance training and, related with, the restoring of the effort capacity which are both validated by practice. That is why I consider that the personal experience is argued, with its successes and failures could be important for the next generations of athletes, but especially for their trainers and sports performance.

Characteristics of training effort specificity

According to Dragnea & Teodorescu (2002, 103-104) and Teodorescu (2009, 150) the means of training are the practical tools that ensure the training of athletes, in order to obtain sports capabilities or performances, and are addressed equally to the physical, motor and psychic sphere. The authors also make a classification of the means used in sports training, as follows:

- means of training or lessons;
- means of restoring the capacity for effort;
- competitive means.

As for specificity, this refers to:

1. the sport practiced;
2. the objectives of the training periods;
3. association and ordering of means.

The specific characteristics of the training also depend on the complexity of the means (Gagea, 1999, 151).

The energy potential, i.e. the mechanical work (MW) performed during the effort, is constituted by:

1. *load* (weight) – the resistive force to be defeated by the athlete's active force;
2. *intensity* (the tempo, proportion) – execution speed (V);
3. *duration* (t) necessary for the performance.

Thus, the product of these factors is equal to the MW provided by the athlete.

The specialized studies (Purkiss & Robertson, 2003, 143) compared two methods for determining internal MW:

1. *absolute mechanical work method* - based on changes in mechanical energy;
2. *absolute power method* – based on the powers produced by the force moments.

The results of both methods were normalized, depending on body weight and running speed, to obtain the "internal biomechanical cost" (IBC). IBC values for normal running were compared for 8 runners with IBC values for inefficient running styles.

The absolute power method was able to detect ineffective styles significantly better than the absolute mechanical work method ($\chi 2 = 3{,}22$, $P < 0{,}05$). In addition, this method showed much less variability when quantifying internal and external mechanical work.

In conclusion, the absolute power method was considered superior for quantifying energy costs in running.

The traditional definition of effort, also called external mechanical work, is not an effective measure, due to the "*paradox of zero effort*". This paradox occurs whenever a body moves at constant speed on a flat surface (for example, running on a treadmill or pedalling an ergometric bicycle without resistance), which results in zero external mechanical work being done, in despite the movements of the hands and arms (Zamparo et al., 2019, 487).

There is also the difficulty of *differentiating between effective and ineffective movement*. For example, if a person pedals against a known resistance at a set speed, the calculated amount of effort would be the same despite external movements such as waving or shaking the head.

We can appreciate the *physiological cost* by determining the oxygen intake, but this does not provide information about possible mechanical differences. For example, if runner A has a lower cardiac capacity (VO2 max) than runner B, A's running style must be more mechanically efficient in order for him to win the race. To determine the mechanical differences between the styles we need to know the amount of internal mechanical work done by the runner.

In order to calculate the internal mechanical work consumed, different computational models have been proposed, most of them resorting to the traditional approach, to examine the changes in segment energies, in order to estimate the mechanical consumption.

According to the study by Purkiss & Robertson (2003, 143), the original equation, called the "pseudo-exertion equation", was developed by

Norman and his collaborators, and Winter refined it so that the effort was determined for the whole organism, not only for segments, and extended it to include energy transfers within and between segments (Purkiss & Robertson, 2003, 143). The equation was called the "equation of internal mechanical work" or Wwb (work within and between segments – the mechanical work that allows transfers within the segments and between them).

A different approach would be to calculate the internal mechanical work, which would eliminate these problems, using inverse dynamics and joint power analysis. The method calculates the powers produced by the moments of force in the joints and integrates them in relation to time to identify the mechanical work performed. Winter (2009, 102-104) is the one who described the principles on which this method is based, although Elftman (1939, 206-208; 1966, 363-364) was the first to establish its basic equations, in 1939. But the method was not used very often, probably because a credible tool was needed to determine soil reaction forces and because of the compactness of the calculations.

In the Elftman equations, the positive and negative values cancel each other before integration, thus ignoring the internal mechanical work done. Aleshinsky eliminated this disadvantage, by modifying the power equations, so that the absolute values of the powers of the moments are added, to determine the total mechanical work (internal and external). He also established the validity of the power of moments method and identified the errors induced by the energy method (Aleshinsky, 1986, p. 288).

Although the absolute mechanical work method is mechanically invalid relative to the absolute power method, few studies have been conducted to identify whether there are significant differences between the two methods.

In a study by Purkiss & Robertson (2003, 145-149), applying the Chapman Protocol to 8 athletes (4 men and 4 women), the IBC for average normal running (considered efficient style) was compared, statistically, with the IBC values for each of the modified running styles (inefficient styles) in each of the 4 elite male runners and in each of the 4 female elite runners. The comparison was made, for each of the two methods, whenever the ineffective runs were significantly different from the normal runs. The tested subjects (4 men and 4 women, over 18 years of age) were runners of medium distances or on rugged terrain, with at least 2 years of experience in training and sports competitions. Documentation was made on the age, sex, height and weight, as well as on the length of the various segments of the respective athletes.

The ground reaction forces were sampled at 200 Hz. Each subject performed five normal running tests, at a self-imposed pace, followed by one running test with a modified style, in four variants, namely: exaggerated knee flexion (EKF), over-striding (OS), stiffness of the knee joint (stiff knees) and exaggerated arm-swing. Performance of each type of modified run occurred after verbal description and a physical demonstration, with the goal being to run exaggeratedly but maintain accuracy when hitting the measuring platform.

Only one trial was recorded for each modified running style, due to the difficulty of replicating these running patterns, which were new to the athletes. The digitized data were synchronized with the force platform, using a customized program (*Biomech Motion Analysis System*).

Since the laboratory configuration did not allow the use of two measurement platforms, a single step (from the left foot off the ground to the right foot off the ground) was evaluated instead of a whole cadence. Runners were assumed to be bilaterally symmetric.

Later, two-dimensional segmental kinematics and inverse dynamics were used to calculate the gross moments of the forces in the 11 joints. From these, the values for internal and external mechanical work were calculated, by two different methods. One of the methods resorted to the modification of the energy of the segment, and the other used the integral of the powers in the joints, to determine the internal and external mechanical work.

When calculating the external mechanical work (Purkiss & Robertson, 2003, 145), the absolute mechanical work method sums the segmental energy changes within the movement cycle. This is the equivalent of subtracting the body's total initial energy from its final total energy:

$$W_{ext} = \sum_{i-1}^{N}\left[\Delta\sum_{s-1}^{S}\mathrm{E}_{si}\right] = \sum_{i-1}^{N}\Delta E_T = E_{T_X} - E_{T_0}$$

where:

- Wext = the external mechanical work, calculated by the segmental energy method;
- N = the number of frames in the motion cycle;
- S = the number of body segments;
- Esi = the energy of segment s, at time i;
- ETN = the total final energy of the body;
- ET0, the total initial energy of the organism.

For the absolute power method, the external mechanical work was calculated as the sum of the powers of the moments, within the movement cycle (time), where the power of the moment is the product of the joint gross moment and the angular velocity of the joint:

$$W_{ext} = \sum_{i-1}^{N} \sum_{j-1}^{J} \mathrm{P}_{ij} \Delta t = \sum_{i-1}^{N} \sum_{j-1}^{J} \left(\mathrm{M}_{ij} \omega_{ij}\right) \Delta t$$

where:

- Wext = the external mechanical work, calculated by the moment power method;
- Pij = joint moment power j, at time i – Mij = moment of force in the joint j, at time i; ωj, = joint angular velocity;
- Δt = sampling interval: 1/100 s;
- J = number of joints.

The internal mechanical work cannot be determined directly, so the total mechanical work is calculated, and then the external mechanical work is subtracted from it, resulting in the internal mechanical work. The method, based on the calculation of segmental energies, sums the absolute values of the changes in the body's total mechanical energy, for one movement cycle (called Wwb), then subtracts, from the resulting value, the external mechanical work performed (Pierrynowski et al., 1980,155-156).

In this method, the external mechanical work, calculated energetically, was subtracted (Wext) and the resulting value was called "absolute mechanical work". The other method, based on the gross moments of the forces, added the absolute values of the powers produced by the moments of the forces and subtracted, from the resulting value, the external mechanical work (Purkiss & Robertson, 2003, 146-149).

For this method, the external mechanical work calculated from the powers (W'ext) is subtracted and the resulting value is called "absolute power".

The two equations for the internal mechanical work are as follows:

Absolute mechanical work	$\sum_{i-1}^{N}\left[\Delta\sum_{s-1}^{S}E_{si}\right]-W_{ext}$
Absolute power	$\sum_{i-1}^{N}\sum_{j-1}^{J}\lvert P_{ij}\rvert\Delta_t-W_{ext}$

R. Manno (1992) states that, in the use of one of the categories of means, the following elements must be taken into account:

- ✓ *the structure of the movement* – is determined by the kinematic and dynamic characteristics, which can be deduced from the competitive effort and from its comparison with the training effort;
- ✓ *load structure* – is based on the analysis of the internal reactions caused by physical exercises, which can target anaerobic alactacid, lactacid, anaerobic-aerobic, aerobic or plastic (anabolic) processes;
- ✓ *topographical structure* – targets the muscle groups involved in the correct execution of the specific technique;
- ✓ *the motor situation* – involves the technical-tactical orientation of the exercises used.

In order to have a broader view on the athletic training specific to the half-distance tests, at the world top level – seniors, we present the in-depth content of the means of action. In terms of working methodology and presentation, the ideas expressed below are the fruit of practice and experience accumulated in personal training.

South Africa's high altitude training base, Potchefstroom, is a favourite of many elite athletes from around the world due to the training conditions it offers. The training facilities, the terrain, the climate and the recovery base are some of the reasons why my trainer decided this location as a training ground.

In the lines below we will present possibilities for applying the means of action in weekly cycles, stages and preparation periods. The logical sequence of these elements will form the training plan that will express the work strategy for a specific period of time.

The starting point of a training program will be the establishment of competition distances (basic test and complementary test), the competitive calendar and the proposed time performance.

As means of general training, exercises from the jumping school can be used: jumps with knees to the chest, jumps from the place over an obstacle, lateral jumps over the crate, deep jumps while squatting, etc.

As means of specific training, exercises from the running school are used:

- *easy running* (e.r.) – for the purpose of recovery and psycho-motor relaxation;
- *long run* (l.r.) – example of use: within the weekly cycle, 1-2 maintenance training, but also active recovery of the body, through long runs, the intensity of which will be 75-85% of the aerobic capacity (a.d.1). Also within this cycle, long runs will be scheduled, in order to increase the aerobic capacity (aerobic threshold), whose intensity will be 86-101% of the individual's aerobic potential (a.d.2). In the annual training cycle, the share of a.d.1 is descending (by volume), which means that at the beginning of training, the mean will have a large volume of work, which will gradually decrease, being replaced by a.d.2;
- *running at a uniform pace* (r.u.p.) – example of use: fragmented uniform pace running. It is a type of effort characteristic of the mixed zone, which will be used mainly on the track, but not only. It is characteristic for athletes aiming for indoor and track competitions, but it will also be used in the preparation of those aiming for cross-country competitions, with the required differences in intensity and distance. This means of work is intended to fragment the distance of the competition (in the half-distance and long-distance tests) and to offer the possibility of using, in the training process, high work intensities, on fragments of pre-established distances;
- *running at a uniform linear pace* – examples of use:

  I. Basic training period:
  a) 6 km r.u.p. (70% r.p.p.);
  b) 6 km r.u.p. (5-7% over performance);
  c) 6 km r.u.p. (5-7% over performance; without exceeding by more than 15% the performance a).

  II. Basic training period:
  a) 8 km r.u.p. (70% from r.p.p.);
  b) 10 km r.u.p. (the basis for establishing the intensity will be the time performance from II a), without exceeding 85% of the r.p.p.);
  c) 12 km r.u.p. (II b) – intensity standard.

Regarding the means of specific training, we also add that this segment of the global program will be very mobile, in the sense that adjustments or changes will be made depending on the situations encountered. Their solution will depend on the creativity and thinking of the specialist, who has at hand information received from the subject in question.

The development of the weekly cycle will be based on the global training program, depending on the conditions and training possibilities. It will be resorted to a fragmented expression of the effort requirements and to the possibility of solving some deficiencies in preparation, observed in the previous season.

The location of the means of work and their presence will be consistent with the effort requirements of the stage and the preparation period.

Based on the experience accumulated over the years, I have formed the opinion that the weekly cycle should not be more than 4 weeks, but not less than 3 weeks. This is the amount of time the body needs to adapt to the effort requirements of the current stage. It is also the essential condition for moving to a higher level of training, which will ensure the adaptation of the body to the higher effort conditions of each work stage.

Directing the effort, based on the weekly skeleton, will take into account the effort priorities of the stage and period in progress, each of which has a specific programming of the effort, through the specific means used in training, and will respond to the demands of the necessary effort, falling within the global training plan. These possibilities of scheduling and directing the effort, in the training process, will be used at different moments of the training depending on the momentary requirements of the work period.

As for the means of a mixed or intermediate nature, they are located on the border between those of general training and those of a specific nature. They are planned in the basic mesocycles of the general training stage and in the first mesostructures of the specific training stage.

The training mesostructure consists of a set of mesocycles lasting 3-6 weeks. These represent relatively completed sequences, which allow ensuring the development of conditional capacities or the formation of particular skills or abilities.

Completing these weekly cycles with high loads (intensity and volume) of effort was possible due to the very good weather conditions (austral summer) and the varied range of running routes (flat terrain and varied terrain). The excellent recovery possibilities after the effort and the help of the training partner (Tudorie Dumitru) completed the optimal training conditions and contributed to the achievement of the programmed effort parameters in the training process.

We emphasize that weekly cycles do not guarantee performance, by automatic inclusion in the training program of other athletes.

The principle of individualization, at such a level of performance, is the main characteristic of training. In this sense, we can exemplify a stage of the basic training, which the author performed at altitude, to highlight the specificity of the training.

PREPARATORY STAGE/ BASIC ALTITUDE TRAINING (December)
Potchefstroom (1.480 m alt.) South Africa

Weekly cycle 30.11- 06.12.1998

Monday	A1:	*Mob. + 14 km duration run (4:15/1.000 m) + mob.*
	A2:	*Mob. + 15 km duration run (4:05/1.000 m) + mob.+ relaxation exercises + strength*
Tuesday	A3:	*Mob. + 15 km varied terrain running + mob.*
	A4:	*Mob. + 12 km duration run (4 :05/1.000 m) + mob. + relaxation ex.* *5 x 100 m launched run (technique) + walking lunges (3 x 30 steps)*
Wednesday	A5:	*Mob. + 18 km varied terrain running + relaxation exercises*
	A6:	*Mob. + 12 km varied terrain running + relaxation exercises + mob.*
Thursday	A7:	*Mob. + 15 km duration run (3:50/1.000 m) + mob. + mob. + relaxation exercises + strength*
Friday	A8:	*Mob. + 8 km duration run (4:05/1.000 m) + mob. + sp. Warm-up ex.* *5 x 5 x 150 m uphill run (large range of motion); ps: 2' e.r. = launched run 2 x 150 m uphill run (high frequency of execution)*
	A9:	*7 km duration run (3:55/1.000 m) + mob.* *14 km duration run (4:00/1.000 m) + mob.*
Saturday	A10:	*Mob. + 3 km duration run* *16,6 km varied terrain running (long fragments of effort)* *2 km e.r. + mob.*
	A11:	*10 km duration run (3:55/1.000 m) + mob. 10 x 100 m launched run + mob.*
Sunday	A12:	*Mob. + 16 km varied terrain running + relaxation exercises + mob.*

(Personal Training Plan of the athlete G.S.: 1998-1999)

Weekly cycle 07.12-13.12.1998

Monday A1: *Mob. + 3km e.r. + mob. + back exercises + launched run*
4 km-2 km-2 km r.u.p.; pl.:3'; p2:3'; ps:4' e.r. + launched run
3 km-2 km-1 km. r.u.p.; p 1:3'; p 2:2' e.r.
A2: *2 km e.r. + mob.*
Mob. + 10 km duration run (4:05/1.000 m) + mob.
4 x 100 m launched run (mileage)

Tuesday A3: *Mob. + 15 km varied terrain running + mob. + relaxation*
A4: *exercises*
Mob. + 12 km duration run (4 :00/1.000 m) + mob.
5 x 100 m launched run (technique) + strength

Wednesday A5: *Mob. + 3 km e.r. + mob. + launched run*
15 km varied terrain running (short time fragments of effort)
3 km e.r. + mob.
A6: *Mob. + 12 km duration run (4:05/1.000 m) + mob. + stretching*

Thursday A7: *Mob. + 8 km duration run (4:05/1.000.m) + mob. + launched run*
Strength exercises (abdomen, back, arms) + relaxation exercises

Friday A8: *Mob. + 8 km duration run (4:05/1.000 m) + mob. + launched run*
3 x 5 x 160 m uphill run (large range of motion)
2 x 4 x 140 m uphill run (high frequency of movement)
7 km duration run (3:50/1.000 m) + mob.
A9: *Mob. + 12 km duration run (3:50/1.000 m) + mob.*
6 x 100 m launched run (technique)

Saturday A10: *Mob. + 3 km e.r + mob.*
8 x 100 m launched run
6 km-3 km-2 km-1 km r.u.p..; p1:4'; p 2:3'; p3:2:30
3 km e.r. + mob.
A11: *Mob. + 12 km duration run (3:55/1.000 m) + mob.*

Sunday A12: *Mob. + 15 km varied terrain running + mob.*
A13: *Mob. + 10 km duration run (3:55/1.000 m)*

(Personal Training Plan of the athlete G.S.: 1998-1999)

Weekly cycle 14.12-20.12.1998

Monday A1: *Mob. + 15 km duration run (3:55/1.000 m) + mob. Strength (abdomen, back, arms)*

Tuesday A2: *Mob. + 12 km duration run (3:53/1.000 m) + mob.*
A3: *Mob. + 2 km e.r.*
13 km varied terrain running (short bursts of effort)
3 km e.r.+ mob.

Wednesday	A4:	*Mob. + 12 km duration run (3:45/1.000 m) + mob.* *6 x 100 m launched run + mob.*
	A5:	*Mob. + 15 km varied terrain running (57:27) + 1 km e.r. + mob.*
Thursday	A6:	*Mob. + 10 km duration run (3:55/1.000 m) + mob.*
	A7:	*Mob. + 1 km e.r. + mob. + spec. ex. + launched run* *6 x 2.000 m r.u.p.; p:2:30-3' e.r. + launched run* *Average: 6:41* *3 km e.r. + mob.*
Friday	A8:	*Mob. + 16 km duration run (3:50/1.000 m)* *Strength exercises*
Saturday	A9:	*Mob.+ 12 km duration run (3:50/1.000 m) + mob.*
Sunday	Free	

(Personal Training Plan of the athlete G.S.: 1998-1999)

Weekly cycle 21.12-27.12.1998

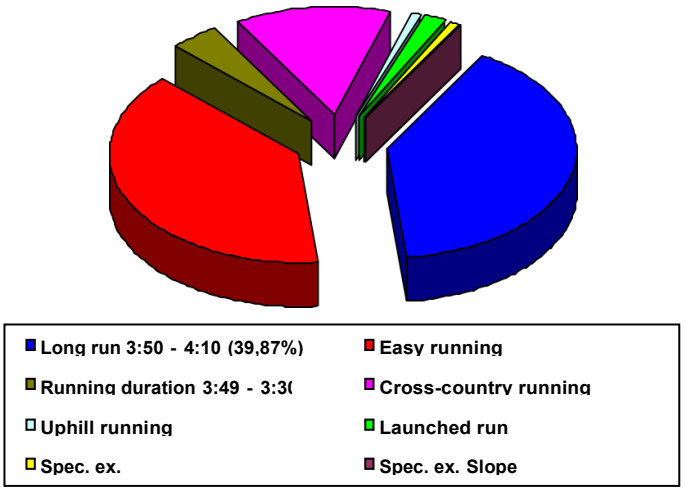
Monday	A1:	*Mob. + 16 km duration run (3:43/1.000 m) + mob.* *Relaxation exercises*
	A2:	*Mob. + 14 km varied terrain running* *4 x 100 m launched run (technique) + mob.*
Tuesday	A3:	*Mob. + 3 km e.r.+ mob.* *15 km varied terrain running (fragments of average effort times)* *3 km e.r. + mob.*
	A4:	*Mob. + 12 km duration run (3:50/1.000 m) + mob. Relaxation exercises + Strength exercises*
Wednesday	A5:	*Mob. + 14 km varied terrain running + mob.*
	A6:	*Mob. + 12 km duration run (3:50/1.000 m) + mob.*
Thursday	A7:	*Mob. + 10 km duration run (3 :55/1.000 m) Relaxation exercises* *Mob. + 4 km duration run (4:00/1.000 m) + mob. 10 x 100 m launched run*
	A8:	*6 x 2.000 m r.u.p.; p:3' e.r. + launched run Average: 6:39* *3 km e.r. + mob.*
Friday	A9:	*Mob. + 15 km duration run (3:52/1.000 m) + mob.* *Mob. + 15 km duration run (3:52/1.000 m) + mob.* *4 x 100 m launched run (relaxation)*
Saturday	A10:	*Mob. + 8 km varied terrain running + mob.* *5 x 5 x 160 m uphill run (recovery pause between reps 25m); ps: 2'* *e.r.*
	A11:	*6,5 km duration run (93:55/1.000 m)* *Mob. + 12 km varied terrain running + mob. + relaxation ex.*
Sunday	A12:	*Mob. + 3 km duration run (3:55/1.000 m) + 12 km varied terrain running (short time fragments of effort) + 2,5 km e.r. + mob.*
	A13:	*Mob. + 12 km duration run (3:50/1.000 m) + mob. + strength ex.*

(Personal Training Plan of the athlete G.S.: 1998-1999)

The presented stage is a model of the methodical conception in the basic preparation (to be repeated in the spring). It is a tough stage that does not contain many means of preparation. Athletes hardly endure it, both physically, but especially mentally, due to the monotony of training, but it will bring performance success in the competitive stage, provided there is a solid basis of training (Personal Training Plan of the athlete G.S.: 1998-1999).

Most specialists forget about the need to "charge the batteries" for this period, entering directly into a specific track preparation. This way of approaching the athletic season will yield very good results at the beginning of the competitive period, but the results will decrease dramatically as the season progresses. The explanation is given by the lack of a solid base of basic (aerobic) training, which makes it impossible to sustain the effort requirements of the competition.

The representation of the percentage of work, in a stage of preparation, is illustrated in the graph 2.



Graph 2. Example of a graphic presentation of run types from November 1998
Source: Author's Personal records

The motor characteristic of the training effort

According to Gagea (1999,151-152), the motricity characteristic refers to the amount of movement, mechanical work consumed, as well as the relative duration of the effort and the total duration of the training. This is the higher the average amplitude (A) of all means provided, the longer the training duration (t) and the higher the density of means (d) (relative to the breaks between means). Their product denotes the training volume: V = A x d x t

Volume implies the total amount of effort put into training. Bompa & Buzzichelli (2021, 73-74) says that there are two types of volume:

 relative volume - the total time that athletes dedicate to training, within a training session. This type of volume is rarely of value to the individual athlete. Thus, the coach knows the total duration of the training, but does not have information about the volume of effort of each athlete, in the unit of time (especially in team sports);

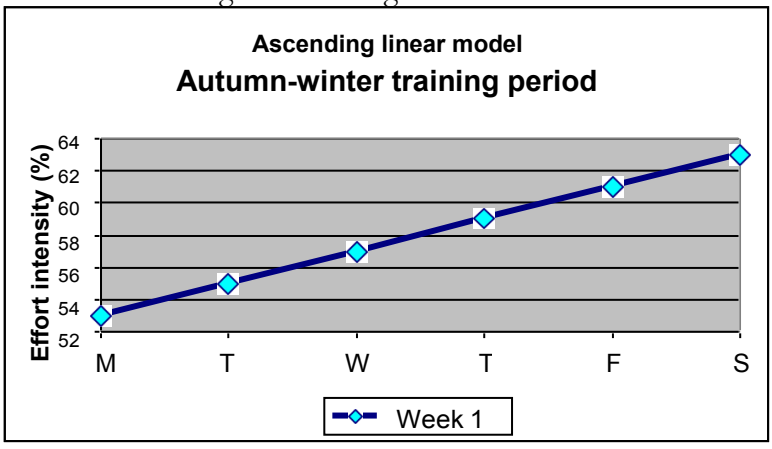
 absolute volume - the amount of effort made by each athlete, in the unit of time; it is expressed in minutes.

Intensity (pace) represents a qualitative component of effort; it can be measured according to the type of exercise.

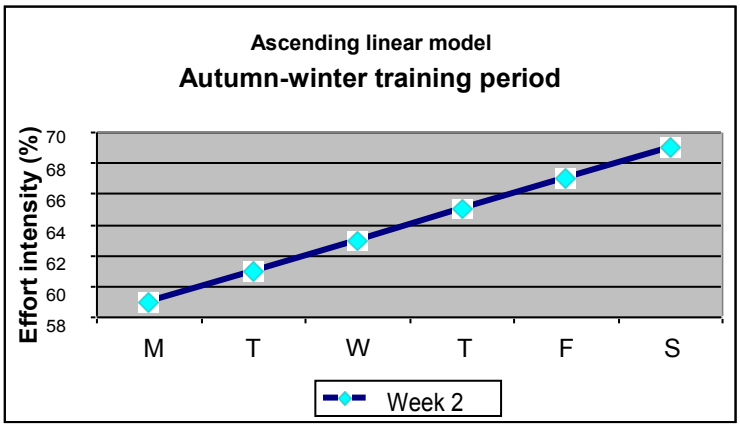
In endurance tests, intensity and volume are found, within each workout, in a stable but not limited relationship. Therefore, the ability to perform a certain volume of work is the lower, the higher the intensity of the effort; lowering the intensity offers the possibility of increasing the volume, which becomes more accessible as it decreases.

a. the linear-ascending programming of the effort (intensity) will characterize the weekly cycles and the stage of reaccustoming the body to the effort and the strict lifestyle imposed by the performance, after a period of rest, recovery or solving other problems (injuries, birth). The starting point will be in accordance with the results of the stress tests of the medical control and the state of health.

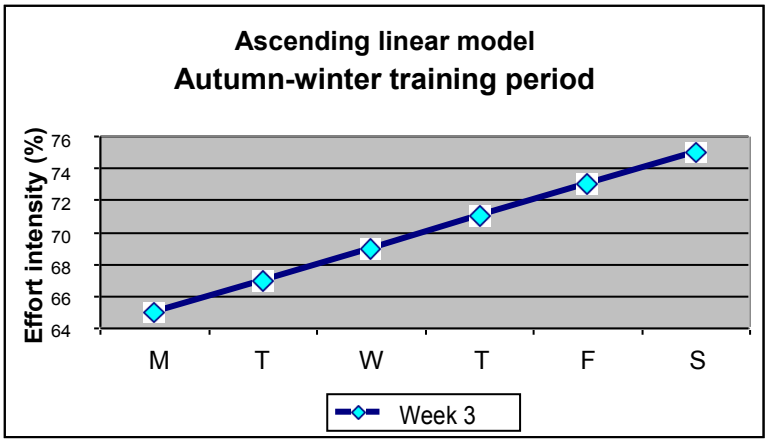
Graphs 3-6 show an ascending linear model of training, during the autumn-winter period, for a period of four weeks, resulting from observations made during own training sessions.



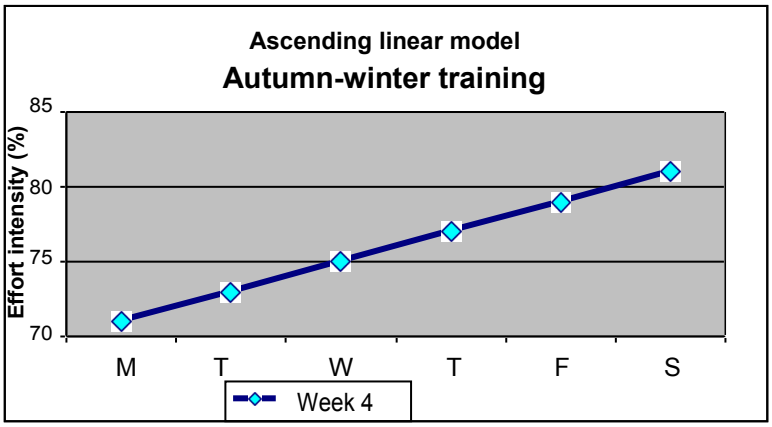
Graph 3. Autumn-winter training model (week 1)
Source: Author's Personal records



Graph 4. Autumn-winter training model (week 2)
Source: Author's Personal records



Graph 5. Autumn-winter training model (week 3)
Source: Author's Personal records

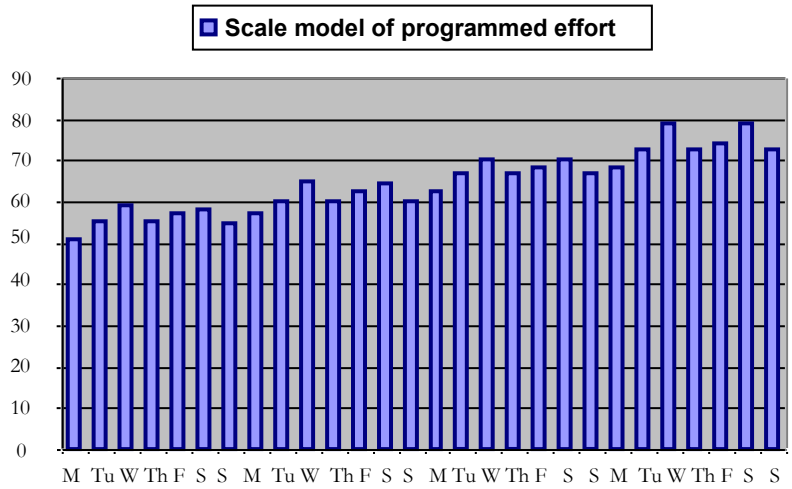


Graph 6. Autumn-winter training model (week 4)
Source: Author's Personal records

In our example, the starting point (for the first week of work) is 53% of the effort capacity, at the time of the start of the training. After 4 weeks of work, the effort intensity of the means of work used in training will increase to 80% and represent the body's work capacity for that moment.

We consider it appropriate to draw attention to the fact that these work intensities (in percentage terms) should not be confused with those of effort, in the case of sports fitness. Each weekly cycle, each stage and period covered, will increase the athlete's effort capacity, through the work performed. Thus, the intensity percentages used in the training process will also change. For example: that 53% of effort capacity, from the beginning of training, will not be the same as the 53% effort requirements of the second stage of the first weekly training cycle. The explanation lies in the effect of training on the body, by increasing the effort capacity and supporting progressively ascending work intensities scale programming model of effort in the weekly cycle and its mirror in the work stage. This method is very mobile, as it creates multiple possibilities for directing and adjusting the effort, depending on the demands of the stage or training period of the athlete at a given time. It is a working method agreed by many specialists.

Graph 7 shows a scale model of the programmed effort.



Graph 7. The second stage of preparation (the percentages are indicative and may change at any time, depending on the state of training)
Source: Author's Personal records

b. For the competitive stages, the weekly work cycles will keep a plateau of intensity and volume, and work will be done to maintain the state of sportive form.

To exemplify, we will again use the example extracted from personal activity, showing the form of chaining of working means, based on the weekly structures, used by Gabriela Szabo in her own training.

The 3 + 1 work system, i.e. 3 days of two workouts each, and the 4th day with one workout, in a chain that will be kept throughout the stage, approaching a day of total rest, at the end of the stage of 4 weeks; it is a very demanding means of training and requires the fulfillment of certain conditions of success:

1. talent, calm and perseverance;
2. perfect fusion of the coach's and the athlete's conception of performance;
3. keeping a sense of reality, on the part of both;
4. ensuring recovery conditions after effort (massage, sauna, shower);
5. choosing the optimal place for preparation and the presence of several landforms;
6. creating socio-professional security;
7. providing medication to support the effort.

The complexity characteristic of the training effort

This characteristic tries to differentiate the impact and consequences of the provision of a set of means, of certain specificity and with a certain volume of precalculated global effort, when changing the order and association of those means. In this sense, the example of the weekly cycle, from the stage of basic training to altitude, is eloquent.

The complexity of training is given by the structure, order and association of the means of training and reflects the multitude of possible biological effects on the athlete, depending on these structures.

Conclusions

From personal sports practice and from my own observations, random or systematic, I have identified a wide range of affective experiences, reactions to success and failure, which I think any runner, can have. Metaphorically, I could recall a phrase known as "the loneliness of the long-distance runner", which describes the situation in which emotional experiences can be diverse and complex. My path in performance can be compared to a ladder with several steps: in order to step as high as possible, it was necessary to give up many joys, comfortable activities, channeling all my physical and mental resources to performance. Apparently, it is a sacrifice, but every distance covered, every second gained, meant a victory for me, and thus I could anticipate a new success, a new victory. Over time, I learned to control my emotions, to know my opponents and to harmonize my expectations and aspirations. The demanding coach and hard training forced me to strictly manage my time and energy, to organize and plan every detail of my training, to conscientiously and persistently approach the efforts imposed by the middle distance tests, to avoid "monotony" and to resist the temptations of age.

After so many privations and exhausting efforts, winning the big competitions, climbing the first step of the podium, were a huge joy, but nothing can compare to winning the Olympic title, and singing the national anthem created a unique experience for me. At that moment, I realized that everything made sense, nothing was in vain.

We can say that runners who tackle races of 800m, 1500m, 5000m, are considered complete runners. They must possess a good aerobic exercise capacity, specific speed as well as a test-specific endurance capacity. The performances over the distances of 1500m, 3000m, 5000m are marked by the aerobic process. To develop the aerobic component, middle distance training will include the following means: medium and long duration runs,

varied tempo runs, Fartlek type work, varied terrain runs, duration run with progressive tempo increase.

The ability to finish the race at the optimal speed is given by the performance on the last part of the trial, this being the proof of a good anaerobic capacity and specific speed. Anaerobic capacity is developed by working at a running tempo located at a level corresponding to the anaerobic threshold, with intensity 4, HR around 85-95% of the maximum.

Due to the fact that the competition takes place in several stages (heats, semi-finals, finals), the middle distance runner must also have a good capacity to restore the body. The changes that occur during the recovery period and that increase the degree of training lead to differentiation in the post-exercise framework of two phases:

1. early recovery or recovery of vegetative functions that change under the influence of muscle activity measured in minutes or hours,
2. late (cumulative) restoration, during which functional and structural changes occur in organs and tissues, as the sum of the latter restrictions - this phase is specific only to efforts closer to them, with a summative character, carried out in different types of macrocycles or mesocycles.

References

Aleshinsky, S.Y. (1986). An energy 'sources' and 'fractions' approach to the mechanical energy expenditure problem - Parts I-V**.** *Journal of Biomechanics*, *19*(4), 287- 315.

Bompa, T. & Buzzichelli, C.A. (2021). *Periodizarea. Teoria și metodologia antrenamentului.* Editura Lifestyle.

Dragnea, A. & Teodorescu, S. (2002). *Teoria sportului* (2nd ed.). FEST.

Elftman, H. (1939). Forces and energy changes in the leg during walking**.** *American Journal of Physiology*, *125*(2), 339-356. https://doi.org/10.1152/ajplegacy.1939.125.2.339

Elftman, H. (1966). Biomechanics of Muscle, with Particular Application to Studies of Gait. *The Journal of Bone and Joint Surgery*, *48*(2), 363-377.

Gagea, A. (1999). *Metodologia cercetării științifice în educație fizică și sport*. România de Mâine.

Manno, R. (1992). *Les bases de l'entrainement sportif*. Editions Revue E.P.S.

Personal Training Plan of the athlete G.S.: 1998-1999.

Pierrynowski, M.R., Winter, D.A. & Norman, R.W. (1980). Transfers of mechanical energy within the total body and mechanical efficiency during treadmill walking. *Ergonomics*, *23*(2), 147-156. https://doi.org/10.1080/00140138008924728

Purkiss, S.B.A. & Robertson, D.G.E. (2003). Methods for calculating internal mechanical work: comparison using elite runners. *Gait Posture*, *18*(3), 143-149. https://doi.org/10.1016/S0966-6362(03)00015-8

Teodorescu, S. (2009). *Periodizare şi planificare în sportul de performanţă.* Alpha MDN.

Winter, D.A. (2009). *Biomechanics and Motor Control of Human Movement* (4th ed.). John Wiley & Sons

Zamparo, P., Pavei, G., Monte, A, Nardello, F., Otsu, T., Numazu, N., Fujii, N. & Minetti A.E. (2019). Mechanical work in shuttle running as a function of speed and distance: implications for power and efficiency. *Human Movement Science*, 66, 487-496. https://doi.org/10.1016/j.humov.2019.06.005