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The skills of programming the training process

by Juri Verchoshanskij

ABSTRACT

The general training strategy is the main methodological concept, which determines the priorities in the organisation of all the phases of the training process.

Each coach must formulate a methodological conception of the athlete's preparation and outline the training strategy for the year. Without an improvement in an athlete's special physical preparation level, one cannot expect an improvement in technical and tactical skill, or in the body's work output, or in the speed of execution of the competition exercise.

The author describes and illustrates three methodological concepts that provide the basis for establishing the general strategy and identifying the appropriate training means.

The author concludes that a concept that clearly shows a "biological" approach may lead to a further development of sports science.

AUTHOR

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1. Premise

Programming means creating a virtual image of the training process that reproduces exactly its contents and organisation. To this end, the coach must formulate a methodological conception of the athlete's preparation based on the elements provided by the specialist literature, and outline the training strategy for the year in question.

The methodological concept (see "Main features of a modern scientific sports training theory", in: NSA 13, 1998, 3), is made up of a set of guidelines on the organisation of the training process, expressing the outlook of the coach and their general ideas on how to manage an athlete's preparation. In all Track and Field disciplines, the methodological concept must always be based on the main principle governing the acquisition of sports skills: performance improvement is determined by a steady increase in the athlete's motor potential and the athlete's capacity to use this potential efficiently during training and competition.

This means that without an improvement in an athlete's special physical preparation level, one cannot expect an improvement in technical and tactical skill, the body's work output, or the speed of execution of the competition exercise. Consequently, neither the planned for improvement in competition skill nor general performance results will be fulfilled.

The training process should therefore be principally aimed at an increase of the body's work output in a given motor regimen (see "Main features of a modern scientific sports training theory", in: NSA 13, 1998, 3,). The coach's main methodological problem is to ensure a high training effect from

the workloads set, with the aim being to increase the body's work output and to organise these loads in such a way that they will not interfere with work on technique or on speed of execution of the competition exercise.

The general training strategy is the main methodological concept, which determines the priorities in the organisation of all the phases of the training process. It should provide for the organisation of three lines of development, with distinct intermediate targets, consistent with the main target of the training process, namely:

- to improve the athlete's motor potential (the target is special physical preparation);
- to improve the athlete's efficiency in using this potential for the competition exercise (the target is technique, tactics and speed of execution);
- to increase the level and stability of competition skill (the target is both psychological preparation and competition preparation).

When programming the training process, the coach should follow the three methodological concepts that provide the basis for establishing the general strategy and identifying the appropriate training means:

1 ➡ the training process may be monitored by observing what changes, if any, are evident in the athlete's functional state or condition, i.e. the variations, caused by the established loads, of the functional parameters directly related with the performance (see "Main features of a modern scientific sports training theory" in: NSA 13, 1998, 3). The athlete's condition must be objectively evaluated at regular intervals (once a month, for instance) and set against established workloads. A methodical observation of this relationship is one of the most important tasks faced by the modern coach. It is important to stress that the data illustrating the variations in an athlete's condition in relation to given work loads is what provides the coach with the opportunity to increase their expertise and their ability to take correct decisions when planning the training process.

2 ➡ work loads must be established taking into account the athlete's real motor potential and fitness status and must be referred to a specific period of time; the organisation of these loads must take into account both the timespan dictated by the rules governing the body's adaptation and the competition calendar. Two conditions need to be fulfilled:

➡ the training effect of each load must be exactly determined, i.e. each load must be specifically aimed at a given energy system or functional system or regulator mechanism, so as to achieve the desired effect;

➡ the aim of the training process must be expressed in practical terms.

The vast literature on sports physiology will provide all the necessary information.

3 ➡ it is important when programming the training process to establish the so-called "model features" of the final objective (see "Main features of a modern scientific sports training theory", in: NSA 13, 1998, 3). These must include specific values for the main parameters of the level of special physical preparation and technique the coach is aiming at. These values will also be the criteria for an accurate evaluation of the training programme's efficiency.

Methodical monitoring clearly indicates the development of the training process and quantifies its efficiency. This favours the athlete's motivation and also supplies the coach with objective data on the realisation of the methodological concept.

2. General approach to programming of the training process

Programming the training process means identifying the optimum variant for its organisation. This is far from easy since there are any number of possibilities as regards content, volume, duration and organisation of work loads aimed at different targets.

In such a situation, the coach will have to proceed by trial and error and try out different solutions - not all the possible options, but certainly quite a number of them. Indeed the number of possibilities greatly depends on the coach's experience; the more experi-

enced coach will know which ones may be eliminated in a given situation, and which other ones are worthy of consideration. The coach must therefore possess the basic knowledge that will allow a preliminary, objective evaluation of the efficiency of a given variant in a specific situation so as to be able to choose the best option.

Figure 1 represents the general approach to the decision making process for sports training programming. The dotted line indicates the order in which decisions must be taken at every stage in the procedure:

I formulate the general methodological concept of an athlete's preparation;

II define the general training strategy;

III elaborate the basic model of the training system;

IV establish the work loads of all the training means objectively required;

V establish the quantitative programme of the preparation.

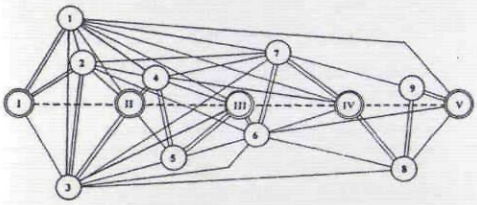


Figure 1: **Plan of the decision making process for sports training programming.**

The double line indicates the logical progression of the analytical operations that determine decisions taken at all levels, on the basis of the required objective data (thin line). These include:

1 the final targets of the training process and their model features, as well as the intermediate targets of each phase of the training process;

2 knowledge of scientific and methodological findings in sport and other related fields (biology, physiology, biochemistry, biomechanics, sports medicine, psychology);

3 the experience gained during the preceding phases of the training process and analytical generalisations provided by sports training methodology;

4 basic principles of the organisation of the training process and of the required workloads:

5 the competition calendar and a strategy for competition preparation;

6 an analysis of the training system model, taking into account the results of the preceding phases of the training process and other factors;

7 the data required to establish the volume of the training loads (total volume and volume of the loads aimed at specific targets);

8 the athlete's individual characteristics and level of preparation;

9 any "material" details (such as funds, implements, apparatus, sports facilities, medical assistance, diet) available at a given moment.

Each choice (or decision) will be made on the basis of keeping in mind all previous decisions and taking into account expected requirements, conditions and any other circumstances that may influence future choices.

I The general methodological concept will be formulated taking into account:

- the final aims of the training process and their respective model features (1);
- the scientific and methodological findings reported in the sports training literature (2);
- the experience acquired in the preceding phases of the training process (3).

The methodological concept must be extremely specific and express clearly the basic principles used to formulate the training system.

II The definition of the general training strategy makes the methodological concept even more factual and specific (1).

It establishes the priorities and the organisation of the training process as a whole and of each one of its phases or components, and must reflect a rational progression of the athlete's preparation for competition. It must take into account:

- the final aims of the training process (1);
- all scientific and methodological data specifically referred to the organisation of the training process (2);
- experience acquired during the preceding phases of the training process (3);

- the guidelines of sports training programming (4);
- the competition calendar and, in particular, the date of the more important events for which the athlete will require specific preparation (5).

It is important to establish the model trend of the athlete's condition in the annual cycle, because it determines the distribution and organisation of the workload and is the basis for the training system model.

III The general model of the training system for an annual cycle is the simplified version of the training process the coach is aiming at. It does not include all the details of the process, but it outlines the main components, those that will determine the lines of development. The general model is established on the basis of the general methodological concept (I) and of the general training strategy (II), taking into account:

- the final targets of the training process and the respective model features (1);
- the guidelines of sports training programming (4);
- the competition calendar (5).

It is always better to plot the general training model on a graph as the principles and assumptions that determine the organisation of the training process will emerge more clearly.

IV The load volume of the main training means is established on the basis of a careful analysis of the general training model (III) and of the possible variants for its implementation. It is important to take into account:

- the final aims of the training process (1);
- the experience acquired during the preceding phases of the training process (3);
- the guidelines of sports training programming (4);
- the competition calendar (5);
- the objective data required to establish content, volume and organisation of the training loads (7) on the basis of scientific and methodological findings (2).

V - The quantitative model of the training programme is developed on the basis of the values established for the load volumes (IV) and taking into account:

- the final aims of the training process (1);
- a careful analysis of the established programme (6);
- the athlete's individual characteristics (8);
- the experience acquired during the preceding phases of the training process (3);
- material conditions (9).

3. A set procedure for the decision making process when programming the main adaptation cycle1

Figure 2 shows the general model for the organisation of the main adaptation cycle (see Organisation of the training process in NSA, 13, 1998,3).

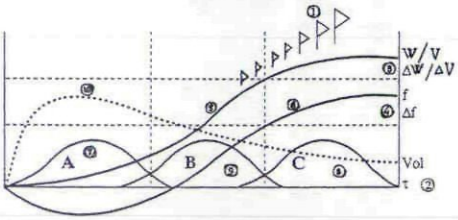


Figure 2: Set procedure for decision making when programming the main adaptation cycle.

The term "main adaptation cycle" is used here to emphasise the importance of the rules governing the adaptation process. The concept "main training phase" is better suited for practical use and for publications on methodology. In any case it should never be mistaken for the so-called "mesocycle" connected to the periodisation of sports training, where it is meant as the sum of a number of microcycles that may be associated in different ways.

The numbers indicate the progression of the practical decisions necessary to establish the quantitative programme of the training process.

1 consult the competition calendar and check the dates of the main events; define the methodological concept for an athlete's preparation; elaborate the general training strategy;

2 define the total duration of the preparation cycle and the chronological order of blocks A, B and C (see "Main features of a modern scientific sports training theory", in: NSA 13, 1998, 3);
3 establish the entity of the desired performance improvement and, as a consequence, identify the increase necessary in the athlete's work power or output (AW) or in the speed of execution of the competition exercise (AV) to ensure said improvement;
4 establish the entity of the required improvement in the athlete's main functional parameters in relation to the desired work power increase;
5 elaborate the model trend of the parameter indicating the body's work power (or speed of execution of the competition exercise) within the main adaptation cycle;
6 establish the model trend of the athlete's main functional parameters, those that have a major influence on the achievement of the desired condition trend;
7 establish the structure of the training means for the special physical preparation (Block A) that will determine the development of the athlete's condition, of the body's work power and of the speed of execution of the competition exercise;
8 establish the competition strategy and the structure of the competition loads (Block C);
9 establish the content and organisation of the special training loads (Block B);
10 establish the total volume of the training loads of the main adaptation cycle.

4. Organising the annual training cycle

The general model of the main adaptation cycle reflects the basic outline adopted for programming the training of high level athletes, without any reference to a specific moment in time or to a specific competition calendar. This model may be used creatively and adapted to suit the motor tasks of a given sports discipline, the competition calendar and the rules of the event. For example, the annual cycle may be structured around one main adaptation cycle (distance running, throws, multiple events) or around two of them (sprints, middle distance running, jumps, throws), depending on the competition calendar and on the chosen final aim (see Figure 3).

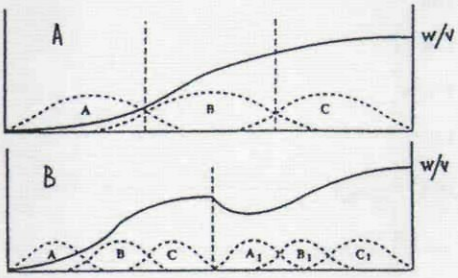


Figure 3: **The two main variants in the organisation of an annual training cycle.**

Variant A is typically used when the competition phase (C) is relatively short and the basic preparation is included in Blocks A and B. Variant B is better illustrated in the case of an extended competition calendar. Competitions are scheduled as early as the second half of Block B, i.e. when the workloads are aimed at developing the body's work power, and they are therefore a component of these loads. In variant B, the more important events are included in Block C and the organisation of the training process has the following characteristics:

- Block A has a shorter duration than Block A1; special physical preparation (SPP) loads in Block A1 have a lower volume but a higher intensity than those in Block A;
- the intensity of the work regimen is higher in Block B1, than in Block B;
- in the second main adaptation cycle, Block B1 may be combined with Block C1, to form a longer competition phase.

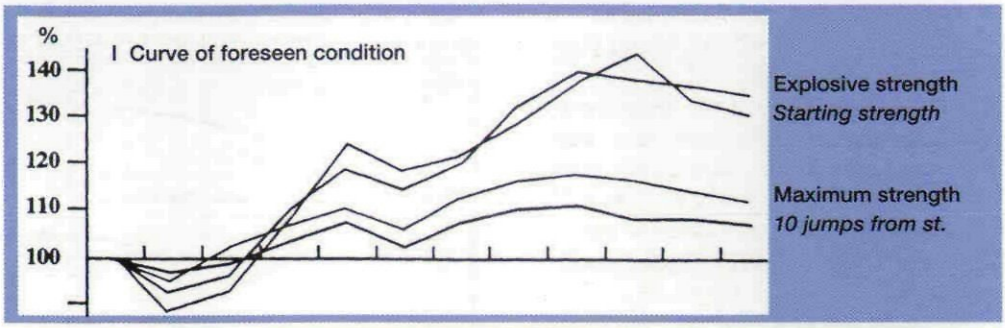
5. Examples of annual training models

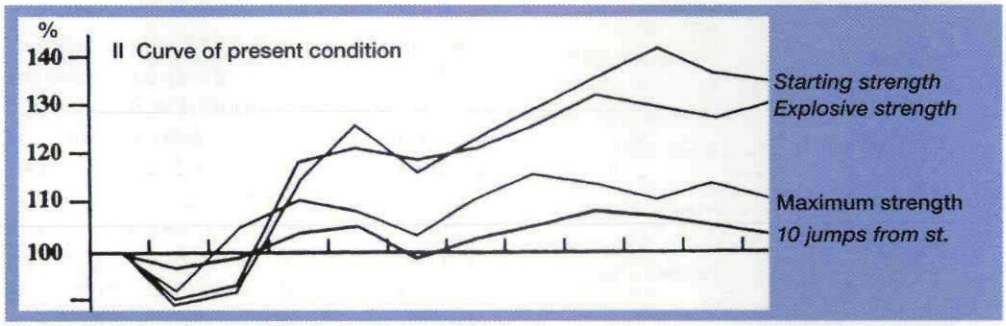
The following are real examples of the organisation of annual training cycles used by Soviet athletes in preparation for the Moscow Olympics (1980). They are all based on the principles described above.

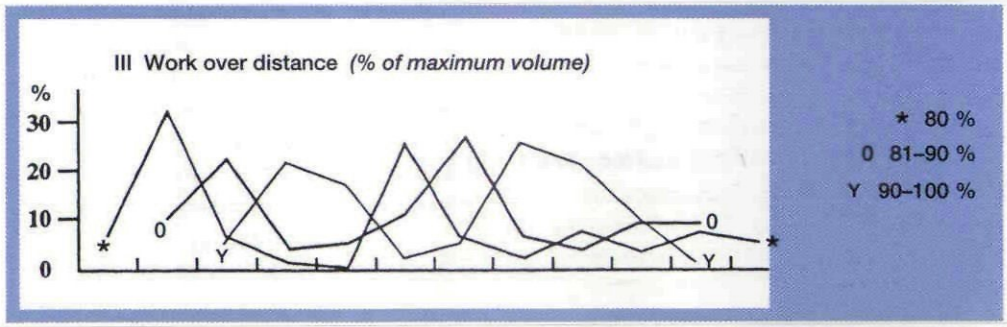
Example 1: an annual training system for sprinters, devised by A. Komeliuk, (Figure 4).

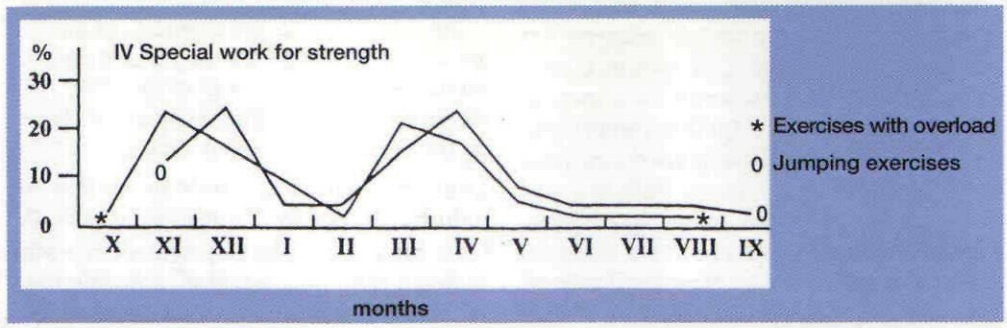
I is the planned development of the athlete's condition, established on the basis of the mean value of maximum strength

Figure 4: Model training system for high level sprinters **Example 1**









and explosive strength of the extensor muscles of both legs (measured with special apparatus) and on the basis of the results of control exercises (standing triple and quintuple jumps); the trend of all parameters is expressed as a percentage of the initial value;

II is the actual development of the athlete's condition during the annual training cycle;

III is the distribution of the training loads (distance covered) in the twelve months, expressed as a percentage of the total volume;

IV is the distribution of the SPP loads, expressed as a percentage of the annual volume.

Note that:

1 the training programme includes two main adaptation cycles which are scheduled so that the end of each cycle coincides respectively with the winter competitions (February) and the summer competitions (May-August);

2 the development model of the sprinters' condition (I) was established taking into account the international competition calendar and the experience acquired during the previous year's training;

3 the training loads are organised so as to superimpose the training effect of loads having different priorities (see "Main features of a modern scientific sports training theory", in: NSA 13, 1998, 3). The progression of specific training means for distance preparation is the following (III): initially the intensity of the runs is up to 80% of the maximum value, then between 81 and 90%, and finally between 91 and 100%.

The SPP loads (IV) are used as follows: to begin with, overload exercises (using particular barbell weights), then jumps and bounds including the so-called "short" bounds (i.e. various combinations of standing triple and quintuple jumps performed at maximum strength) and the so-called "long" bounds (mainly fast alternate bounds over distances of 50, 80 and 100m, performed at submaximal strength);

4 the SPP loads are concentrated (November-December and March-April) so as to exploit in the long term their delayed training effect (see "Main features of a modern scientific sports training theory", in: NSA 13, 1998, 3) and enhance the quality of speed preparation in view of the competition;

5 the actual development of the sprinters' condition (II) shows that the annual training programme fully achieved the planned model (I); the differences between the real values of the speed strength parameters and the planned values do not exceed 5%.

Example 2: an annual training system for long jumpers, devised by Igor Ter Ovanesian, (Figure 5)

I is the planned development of the athlete's condition, established on the basis of parameters indicating the maximum strength (Po) and explosive strength (J) of the take-off leg extensor muscles (measured with special apparatus), and on the basis of the results of control exercises indicating variations of speed strength level (standing triple and quintuple jumps);

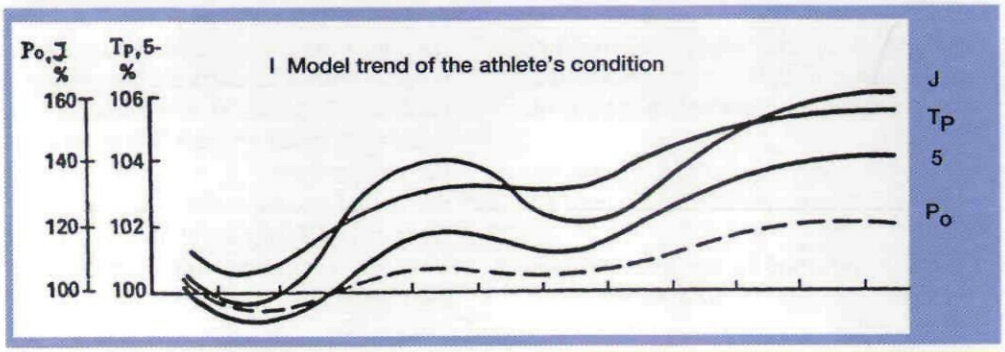
II shows the special preparation means: long jumps (including jumps with full run-up), special exercises with bounds and jumps and barbell exercises;

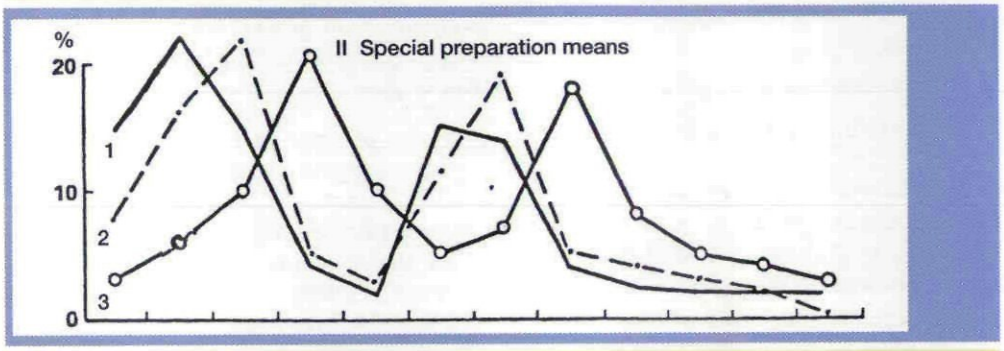
III shows the running exercises: full run-up (including run-up with take-off board), sprints, repetition runs at moderate intensity. As in the previous example, the distribution of the workloads is expressed as a percentage of the total work volume for that year.

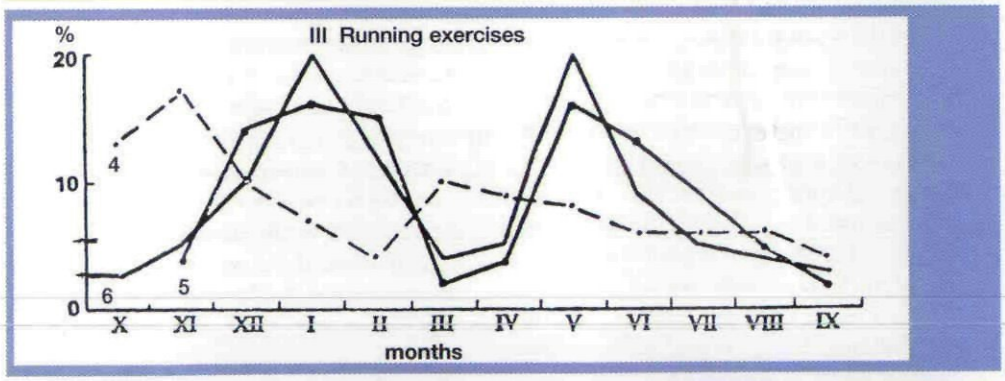
The distribution of the workloads is carefully planned to induce the desired development of the athlete's condition that will establish favourable conditions for an improvement in technique and in the speed of execution of the jump, so as to achieve the programmed performance results in time for the more important events.

The annual cycle includes two main adaptation cycles (October-February and March-September); special strength loads are concen-

Figure 5: Model training system for high level long jumpers **Example 2**







Tp ➡ standing triple jumps
Po ➡ maximum strength
1 ➡ jumps and bounds
2 ➡ barbell exercises
3 ➡ long jumps
4 ➡ repetitions runs
5 ➡ standing quintuple jumps
5 ➡ run-ups
6 ➡ sprints

trated (October-December and March-April) and the achievement of the maximum level of special strength preparation and best performance results are planned for the end of February (1st competition phase) and July-August (2nd competition phase).

Example 3: an annual training system for high level triple jumpers, established by I. Mironenko, on the basis of the athlete development model used for long jumpers (Fig. 6).

Figure 6 shows the monthly distribution (expressed as a percentage of the total an-

Figure 6 **Example 3**
Development of the condition and organisation of the training loads in annual cycle for triple jumpers

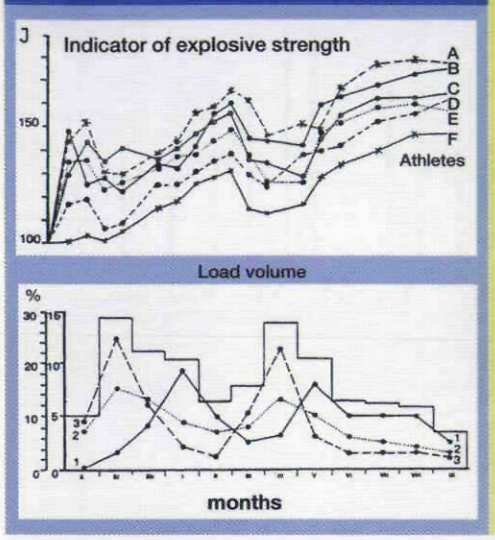
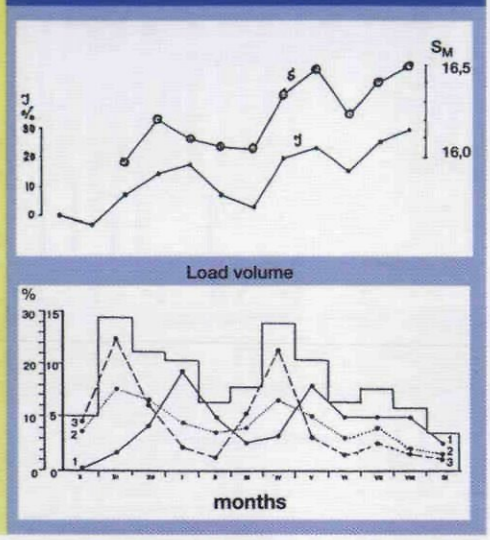


Figure 7 **Example 4**
Annual training cycle of a triple jumper;
S - performance results; J - parameter expressing the explosive strength of the extensor muscles of both legs; Full line - total load volume;1 - triple jump; 2 - barbell exercises; 3 - jumps and bounds



nual work volume) of the main training means and the development of the total monthly work load. The parameter indicating explosive strength of the extensor muscles of both legs (J) expresses the real individual development of the condition of the six athletes. The tests were performed once or in some cases twice a month. The trend of performance results corresponds to the trend of the parameter outlined above.

Two items are particularly worthy of notice:

- in all athletes, the trend of the parameter indicating explosive strength is clearly unidirectional and corresponds to the established model;
- the delayed training effect of the concentrated strength loads is clearly evident, especially its long lasting effect during the 2nd competition phase

The following are two significant examples of mistakes.

Example 4: Figure 7 shows a mistake in the outcome of the training programme of one of our athletes, a triple jumper.

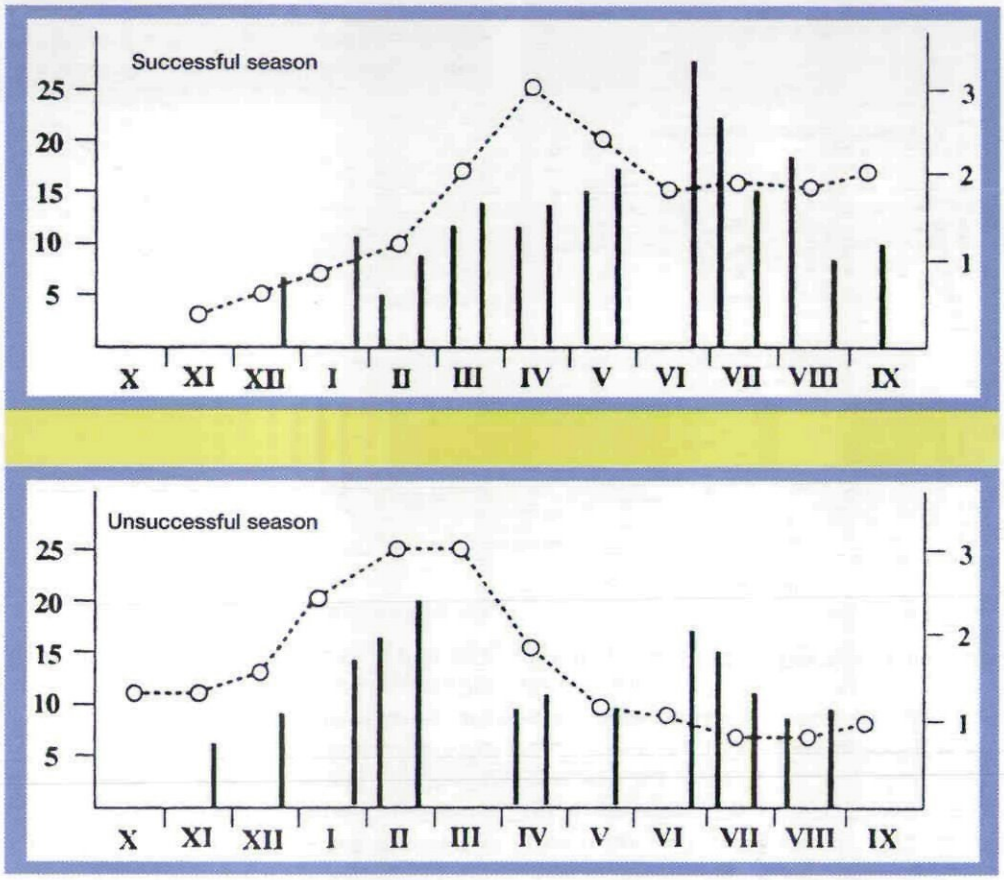
The programme was organised so that the delayed training effect of the strength loads (March-May) would favour the preparation of the major events scheduled for July and August. The athlete worked on his own during the early summer months; he did not believe the delayed training effect would last up to August and so decided to add strength loads in July in order to maintain the achieved level. This altered the adaptation trend and delayed the body's adaptation to a higher level of specific work capacity. As a consequence, the athlete jumped 16.50m instead of the planned 17m and was not included in the national team for the Moscow Olympics.

Example 5 refers to a middle and long distance runner. Figure 8 shows the intensity of the running exercises as expressed by the specific evaluation coefficient.

It is immediately apparent that during the first year, thanks to a gradual intensity increase in distance training, the athlete achieved excellent results, with personal best performances in two events at the end of June.

The following year that same athlete, encouraged by this success, decided to increase the intensity of the distance training so that he reached the previous year's intensity very early, at the beginning of February. Such an

Figure 8 Data referring to two years of the training programme of a middle and long distance specialist.



o-----o Intensive portion of training load (Mean speed)

—— Competitive results over various distances (Mean score)

ill-timed intensification altered the body's adaptation and did not assure the required morphological and functional adaptation to the required work regimen.

The athlete was therefore unable to sustain this work regimen and had to reduce the intensity suddenly. The outcome was a very poor season; the expected results were not achieved because of interference and tampering with the body's reactions.

The concepts on sports training illustrated are intended as a contribution to the ever developing theory on the methodology of training as it refers to high level athletes and they do not exclude a different approach to the organisation of the training process.

We believe however, that the intrinsic value of this concept is that it clearly shows how a "biological" approach (in the literal sense of the word) may lead to a further development of sports science.

It is difficult today to prepare a champion athlete without a thorough knowledge of human physiology; it will become absolutely impossible in the very near future for an athlete to achieve international success if the coach does not have an extensive grounding in this aspect of sports science. ■