BASIC PRINCIPLES APPLICABLE TO THE CONSTRUCTION OF MACROCYCLES

By Dr. Atko Viru

Leading Estonian sport scientist, Prof. Dr. Atko Viru, sums up the basic principles involved in the planning of macrocycles and discusses the main problems in the adjustment of training loads and intensities in the preparation period. The article is based on translated extracts from the author's book Sportlik Treening, published by Eesti, Raamat, Tallinn, Estonian SSR, 1998.

A training macrocycle consists of a year or half a year. This division is based on the competition calendar that is made up from one or two seasons. There is no doubt that one competition season a year is desirable. Unfortunately, however, commercial interests appear to have more influence in the choice than physiological principles The situation becomes even more complicated by the fact that in some years it is necessary to peak for such major competitions as the Olympic Games or World Championships that occur outside the competition seasons.

In attempting to find an answer to these problems, it is important to keep in mind the existing principles governing the dynamics of work and the performance capacity. Athletes, whose coaches fail to take into consideration these principles, will not succeed. On the other hand, if these principles are overlooked by the administrators responsible for the competition calendar, it is unavoidable that the results are good in some meetings and poor in the others.

PLANNING OF MACROCYCLES

The ignorance of physiological principles by administrators forces athletes to adjust their competitive appearances so that they decide which competitions fit physiologically into their preparations. The other competitions are only treated as control tests or simply ignored. It is therefore necessary to take into consideration in the planning of macrocycles the physiological principles as well as the competition calendar. Above all, it is important to keep in mind the following circumstances:

- The arrangement of a macrocycle must proceed from the athlete's total general preparation plan. According to this, emphasis is planned to meet the demands allocated to a particular year for the development of certain capacities. If there is a conflict between the general strategy or a multi-

year preparation plan and the competitive demands in a year, the competitions have to be sacrificed and not the other way around.

- The potentiality of intensive adaptive changes in the organism are limited by the adaptive energy (Selye, 1960), or the adaptive capacity reserves. The exhausted reserves are, as a rule, restored by relative rest (reduction of the training volume). However, further intensive training and competition loads will progressively exhaust the adaptive reserves and can lead to a drop in the performance and finally result in overtraining. It is impossible to assume that an athlete can meet the requests of the competition calendar set by organizers and remain in peak form for six months or even longer. Even the organism of an athlete needs rest.

- How long does an athlete's adaptive capacity last, or how fast does the working capacity deteriorate in the processes of training and competitions? Obviously the expenditure always depends on the intensity, as well as the athlete's preparation level, age and individual characteristics. Practical experience and numerous studies allowed Veroshansky to come to the conclusion that the adaptive capacity of high performance athletes lasts 18 to 22 weeks. The contents of training must be considerably changed after this time period. It also is necessary at this stage to consider a short transition period or a restoration phase.

- A temporary loss of the adaptive capacity and its restoration by the reduction of the training load makes a cyclic construction of training necessary. Matveyev is justified in looking at the cyclic construction of training as one of the basic principles; the cyclic construction is based on the creation of different load directions and an efficient regimen of work and recovery. This is achieved at three levels by forming microcycles (4 to 7 days), mesocycles (made up from 4 to 6 microcycles) and the macrocycle, divided into preparation, competition and transition periods (each made up from several mesocycles).

- The basic parts of a macrocycle, the preparation and the competition periods, are divided into stages, taking into consideration the specifics of an event and the duration of the period. Two basic stages are generally preferred. The aim of the first stage is to create a general base for the development of event specific requirements in the second stage.

- For the purpose of an efficient distribution of the adaptive capacity it is advisable to employ intermittent stages between the timely separated major competitions. Matveyev recommends here an increase of the general conditioning volume and the elimination of event specific training, which is followed by another pre-competition stage.

- Two different tasks have to be solved during a macrocycle: The first is the creation of an athlete's movement potential and the second is the

perfection of its realization possibilities. The first assumes a fulfillment of certain load norm quantities, the second requires the development of a technical level to correspond to the new level of capacities. As the training effect in the first task leads to a high level of fatigue that impedes technique development, the two tasks must be separated.

DISTRIBUTION OF TRAINING LOADS

There are several practical methods available for the distribution of the training loads in a macrocycle. The most universal and well proven approach in a multi-year training plan is to increase the training load in the first and partly also in the second stage of the preparation period. This is followed by an increase of the intensity and a drop in the volume in the second stage of the preparation period and the competition period until the first important competitions (fig. 1). On the background of these two major changes, a wave-load increase pattern also applies to microcycles.

Increased amplitude of the waves is needed at the high performance level in order to achieve forced load cycles. This approach is based on jerky load changes that differ from the basic method only in the dynamics of the changes.

It is common to place emphasis in the beginning of the preparation period on general physical development. The share of specific exercises begins to increase considerably in the second stage of the preparation period, followed by competition specific training during the competition period. In this scheme the athlete uses the first stage of the preparation period for an intensive preparation for specific training in the following stages. The task in the second stage is to reach the maximal level of the performance capacities, achieved mainly through intensive event specific training means. According to Ozolin, the first stage of the preparation period is general, the second specific.

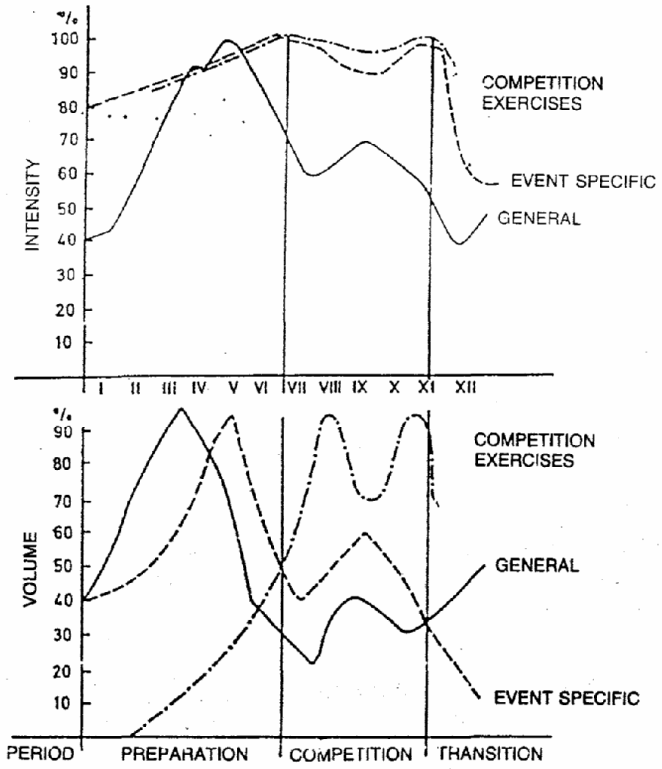

FIG. 1: VOLUMES AND INTENSITIES OF THE DIFFERENT TRAINING MEANS IN PERCENTAGES FROM THE MAXIMUM DURING A MACROCYCLE (According to Matveyev)

Ozolin, considers general physical preparation and its consolidation as the major objective of the first stage. Although event specific training also is included in this stage, it is performed in a volume that does not interfere with the development of physical capacities. The first stage also has an important task in the development of resistance to large training loads. Several Changes take place in the distribution of general physical preparation and specific preparation during the development of an athlete. It is common to have a 3:1 relation between general and specific training in the preparation period for beginners. This changes to a 3:2 distribution and finally reaches 2:2 for high performance athletes.

INTENSITY PROBLEMS

The second stage of the preparation period must allow for the development of event specific capacities and an increase in the intensity. Three principles are applied to the event specific physical preparation: 1) the structure of the exercises must correspond to the movement coordination of the competition performance, 2) it is necessary to use variations of lighter and heavier resistances, and 3) a fast feedback is needed to evaluate the influence of the training.

An increase in the intensity will not take place by simply increasing the frequency of the exercises or the movement speed. There must be a correct proportion maintained between the event specific muscular work and the less intensive other exercises. There also is no value to increase the intensity to a stage where different energy sources to the competition performance become involved. On the other hand, the intensity level is insufficient when the energy mechanisms of the competition performance fail to be exploited.

Running Intensity	Variation	Oct-Dec(%)	Jan-Feb (%)	March-May (%)
Maintenance load (Heart rate 130-150)	1	40.5	23.1	10.0
	2	25.5	27.3	15.0
	3	61.3	42.4	25.0
Training load (Heart rate 150-170)	1	50.5	64.7	73.3
	2	65.9	59.2	70.0
	3	32.7	47.6	62.0
Maximal capacity development load (Heart rate 170-190)	1	8.3	8.8	9.6
	2	7.2	9.4	7.2
	3	5.0	0.7	8.3
Runs at close to personal best speed (90 to 95%)	1	0.1	2.3	4.5
	2	0.4	2.2	4.2
	3	0.0	0.9	2.9
Runs at personal best speed	1	0.6	1.2	2.5
	2	1.0	1.9	3.6
	3	1.0	2.4	1.8

TABLE 1: Three variations of the intensity dynamics of long distance runners during the preparation period. (Travin and Muliarcicas, 1985).

The intensification of the training load and the use of event specific exercises can create problems, particularly in endurance events. The main problem is in deciding which performance capacity has to be emphasized. In middle and long distance running it is a question of emphasizing anaerobic or aerobic work capacities, or in simple words, speed or endurance.

It is known that diversity is closely related to the performance capacity in most events. At the same time it is possible that some factors in the diverse combinations of training develop further the strength of an athlete and compensate the lack of development in other factors. Based on this assumption it is recommended to use three variations of intensification in long distance running, taking into consideration individual performance capacities (table 1). The first combination is suitable for athletes who have a high level of basic speed. The second is suitable for athletes who have to compensate their lack of speed by a high development level of aerobic and anaerobic mechanisms. The third variation fits experienced runners with a good level of speed, as well as endurance. (Travin, Muliarcikas, 1985).

The intensity in the throwing and jumping events is decided by the volume of maximal or close to maximal performance of exercises in the total training volume. Attention also is drawn to the speed of the performance of certain exercises. Fast movements with a 50% load from the maximum, using 12 repetitions in a series, are more effective than exercises performed against 75 to 85% resistance with 4 to 6 repetitions in a series, It is recommended for throwers to increase the intensity by increasing the number of throws with lighter than the competition implements (Voronkin, 1985).

This recommendation has to be treated carefully because an over-emphasized use of lighter implements leads to changes in the neuromuscular coordination. The number of motor units used in the performance is reduced, which in turn reduces the contraction capacity of the muscles involved

The remaining problem in the structure of macrocycles is the gradual decrease of the training effect that leads to a plateau in the performance among high performance athletes. This is related to the problem of how far the training load can be increased to improve the performance without reaching the limits of the adaptive capacity.

According to Brashnikov, the improvement of the specific work capacity begins to drop during a six-month preparation period. The development of the general physical capacities decreases in the second and third month, the specific work capacity in the third and fourth month. Brashnikov's studies showed further that the total volume of training was closely correlated with the progress of the performance only during the first 3 to 4 months of training in the preparation period. However, the volume of event specific training was decisive in the improvement of the performance virtually during the whole preparation period. For this reason it has been recommended to use a cycle of control competitions in the fourth or fifth month of preparation period. Many track and field athletes replace this cycle by taking part in winter competitions. To avoid a drop in the performance at the end of a long summer season, it is advisable to maintain a sufficiently heavy training load right up to the cycle of the control competitions. A short restoration phase should follow the control competitions before the preparation period continues.