SOME FACTS ABOUT MICROCYCLES

By Prof. Dr. Atko Viru

Dr. Atko Viru, Professor of Biology at the University of Tartu, Estonia, discusses the construction and tasks of different types of microcycles in training, looking in detail into accumulating loads and varied loads microcycles. The article is based on translated extracts from the author's book Sportlik Treening, published by Eesti Raamat, Tallinn, Estonian SSR, 1988.

MICROCYCLES

Microcycles in training are responsible for the co-ordination of training loads to establish an effective regimen between work and recovery. This regimen must secure sufficient regeneration before the start of each new microcycle. This means that the function of a microcycle is to provide a rational approach to the exploitation of the training loads planned for a particular training phase.

The duration of a microcycle is usually one week, although athletes who train twice or even three times a day often plan slightly shorter microcycles. As a rule, each microcycle is concluded with one or two recovery days. Most common among the variations are 6 + 1, 5 + 2, 4 + 1 and 3 + 1, in which the first number indicates consecutive training days, the second the number of recovery days.

A microcycle is made up from two phases — the development stimulating phase and the restorative phase. The first applies to the use of training loads, the second to recovery loads or complete rest (Matveyev 1977). The restoration phase usually takes place at the end of a microcycle. However, it is not uncommon to divide a microcycle so that the recovery takes place between two load phases.

There are several possibilities to classify microcycles according to the training processes. Based on Matveyev's classification microcycles are divided into four main categories: 1. developmental, 2. preparation, 3. competition and 4. restorative microcycles.

The developmental microcycle, according to the nature of the employed training methods, is adjusted to general preparation or to specific preparation. In both cases the microcycles are subdivided into ordinary and shock cycles. In the ordinary developmental microcycles the training load and intensity are increased gradually. In the shock cycles the load undergoes an extreme lift by the increase of the volume or the intensity. The shock microcycles, in the first part of the preparation period, aim for general conditioning, in the second part for sport specific development.

The preparation microcycles have the task to secure the readiness of an athlete for the forthcoming competitions. At the same time, the last preparation microcycle before a competition has to mobilize the athlete's performance capacities. This, for some athletes could require training with reasonable work-loads, for others it means tapering by using a reduced load or active rest with restoration processes.

The competition microcycles are designed to organize activities just prior and immediately after a competition: This involves activities a day before the competition, on the day of the competition, and during the recovery days. The organization of the competition microcycles is individual and depends upon the length of the competition, the number of attempts, the frequency of competitions, the performance level of the rivals and so on.

The main task of the restorative microcycles is to create the best possible conditions for recovery. This means training with moderate intensity and a reduced volume, combined with all available regeneration measures.

ACCUMULATING LOADS

A further classification of microcycles can be based on the different co-ordination of training loads. The two common methods used in this classification are the accumulating loads and the varied loads microcycles.

The effects of the accumulation of several consecutive loads show that the restoration of speed, anaerobic and aerobic work capacities remain unchanged (Fig. 1). However, it can be seen that two consecutive speed training sessions are responsible for a drop in speed and slows down the restoration. A somewhat similar situation can be noted in the anaerobic work capacity, showing the problems created by similar consecutive loads.

There are no basic differences in the restoration dynamics when three consecutive loads are applied (Fig. 2), making it clear that the accumulation of several similar direction loads is responsible for fatigue and lengthens the restoration processes of corresponding work capacities.

Studies into microcycles with a 4 + 1 combination of accumulating loads showed that it can in some athletes lead to exhaustion. In this situation it is up to the coach to change in time from the development stimulating phase to the restoration phase. For example, the studies by Baikov came to the conclusion that developmental loads can be continued until the specific work capacity has dropped by 30%. At this stage training had to be changed to 2 to 3 days of recovery loads, followed by another 2 to 3 days of maintenance loads. Rest day are introduced after 2 to 3 microcycles.

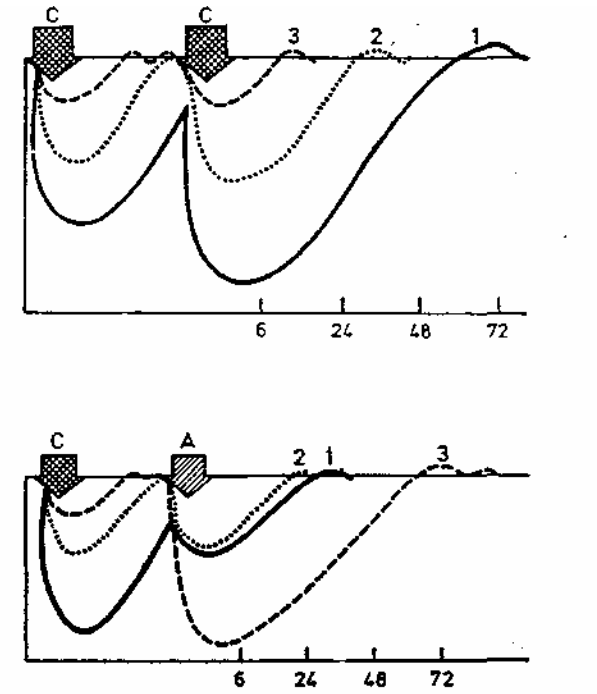

FIG. 1: Recovery dynamics between two loads. Same direction (above) Different directions (below). C = Speed training, A = endurence training, 1 = Speed, 2 = anaerobic capacity, 3 = aerobic capacity.

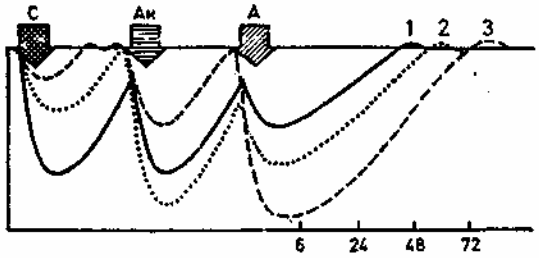

FIG. 2. Recovery dynamics after three different direction loads. C = Speed, An = anaerobic, A = aerobic. 1 = Speed, 2 = anaerobic capacity, 3 = aerobic capacity.

Platonov (1986) summed up the shortcomings of similar accumulating loads in microcycles as follows:

- The accumulation of fatigue is responsible for a drop in the general work capacity of an athlete.
- There is a lack of balance in the development of the different performance capacities.
- There is a possibility that over-training occurs.

VARIED LOADS

Varied loads microcycles aim to exploit the dynamics of recovery processes in order to employ the largest feasible total work volume for the training effect. There are two possibilities to achieve this aim:

1. By alternating maintenance and restoration loads for the effective use of several large loads within a microcycle.

2. By alternating the direction of the loads within a microcycle through switching the basic load on the already recovered function.

The duration of recoveries of the various metabolic parameters are presented as a guide in Table 1. As can be seen the restoration of some functions takes considerable time. It should be noted here that there is a difference in the restorative dynamics between different and similar consecutive loads. Fig. 1 (bottom) gives an example where aerobic endurance training follows speed training. There is no accumulating influence on the speed and anaerobic capacities but the aerobic work capacity drops after the second training session. A similar situation occurs when three different consecutive loads are applied-speed development, followed by anaerobic and aerobic endurance development (Fig. 2).

Obviously, the largest drop and the slowest recovery of the work capacity takes place in the indicators involved in the previous training session. There appears to be no accumulation of fatigue in the other indicators (Platonov, Vaitsehhovski, 1985). This confirms the theory that the use of different loads allows to exploit recovery time for other training tasks. Skillful changing of loads therefore allows the athlete to begin each following workout in a good condition to tackle opposite direction training loads.

It is generally recommended that a microcycle is designed so that large loads in speed and power development take place under optimal conditions. To speed up the recovery processes after heavy loads the following training session should include medium or light loads that are definitely aimed in another direction. It is advantageous to develop speed, flexibility and strength in small muscle groups daily, while the development of large muscle groups should take place every second day. It is important to keep in mind that the varied load microcycles aim not only to exploit purposefully the recovery phase but also to speed up recovery.

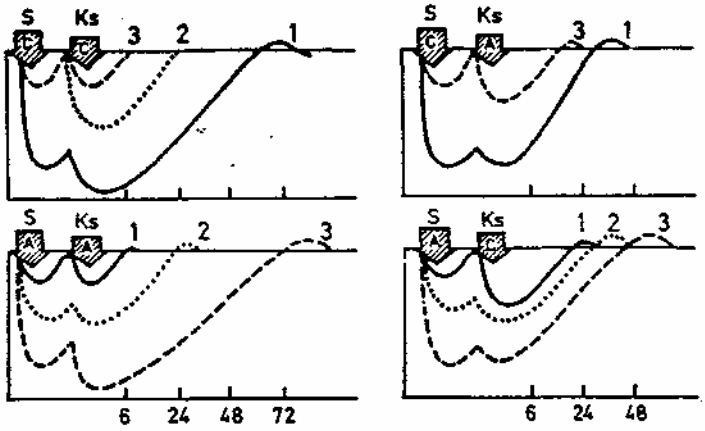

FIG. 3: The influence of a medium load on recovery after a heavy load. Left — same direction, Right — different direction. 5 = high load, Ks = medium load. Other symbols like Fig. 1

**Editor's note: In figure 3 above, "5" refers to "S" in the diagram

TABLE 1: Minimal and maximal restoration times of different metabolic parameters.

Metabolic Parameter	*Minimal Time*	*Maximal Time*
Muscle ATP and creatin-phosphate	2 min.	5 min.
Muscle glycogen reserves	5 hrs.	48 hrs.
Liver glycogen reserves	not known	48 hrs.
Excessive blood lactate	30 min.	2 hrs.
Muscle oxygen reserves	10-15 min.	1 min.
Intensive synthesis of enzymes and structural carbohydrates	12 hrs.	72 hrs.

MULTIPLE TRAINING SESSIONS

Practical experience has shown that several training sessions are needed in the daily routine to reach top level performances. In track and field it is generally accepted that a microcycle of high performance athletes must include 6 to 8 basic and 7 to 12 supplementary training sessions (Ozolin, Homenkov, 1986). The number of training sessions in a microcycle is often increased during the preparation period and can in some cases be doubled.

Multiple daily training was in the beginning approached by simply dividing a heavy training load between two sessions. This helped to reduce the drop in the work capacity in comparison to one heavily loaded workout. It also was discovered that the work capacity was restored faster when the load was divided into two workouts on the same day.

Nevertheless, contemporary knowledge indicates that there is no justification in the division of the same load into several training units. This will only make it difficult to increase the load and takes away the possibility to influence the recovery by medium loads of a different nature. Training two or three times a day will not only allow to increase the load, but also allows to distribute the work more efficiently (Ozonlin, Homenkov, 1982).

A multi-session training day is, as the rule, made up from one basic workout, supplemented by one or two additional sessions (morning, evening). The morning sessions are usually light and have a limited load on the organism. The basic workout must achieve the planned tasks for a particular day, while the evening sessions have mainly a restorative character. The use of two basic workouts a day can be justified only when athletes of a very high performance level have to stimulate the organism in a limited time period.

There is a danger that several training sessions a day can lead to fatigue and over-training. To avoid this requires close cooperation between the coach and the doctor, as well as access to biochemical testing. At the same time, it is essential to keep in mind two main reasons for extreme fatigue:

1. The lack of a rational sequence in the order of different training loads.

2. Failure to consider the influence of the previous load on the athlete’s organism in the planning of the next load.

An example of how to plan a rational sequence of training loads in a multi-session training day in speed and endurance events is shown in Table. 2.

TABLE 2: Efficient sequences of training loads in one training day (Platonov, Vaitsehhovski, 1985).

Basic Training (Heavy Load)	Supplementary Training (Medium or Light Load)
1. Development of basic speed capacities, improvement of speed technique	Development of aerobic capacity, steady method
2. Development of anaerobic work capacity for event specific endurance	Development of aerobic capacity, steady method
3. Development of aerobic work capacity for event specific endurance	Speed training, improvement of speed technique
4. Complex training in order of speed, aerobic and anaerobic work capacities	Complex training or the development of aerobic capacity, steady method
5. Complex training — aerobic and anaerobic capacities in parallel	Speed training
6. Complex training — speed and anaerobic capacities in parallel	Development of aerobic capacity, steady method

Finally, it must be stressed once again the importance of recovery and restoration in the structure of microcycles. The total load of a microcycle can be increased considerably by the speeding up of restoration processes. At the same time it is important not to overlook the influence on the restoration processes on the training effect as it is not always positive. Without going into the details of the complex problems of restoration, it can be said that the methods usually are made up from the following:

- Organizational (the right combination of training loads and the correct time intervals between the training units).
- Psychological (favorable influences in the transfer from work to recovery and later in the transfer from recovery to work).
- Physiotherapeutic (including, among other, massage and sauna).
- Pharmacological (only under medical control).