

## From Macro- to Meso- to Micro-Cycles

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Cycling, commonly known as periodization, had its beginnings in the training of Soviet athletes well over 20 years ago. Through research and sports practice, the Soviets discovered that in order to develop a high-level (Olympic) athlete and to insure a system for developing reserves and future top athletes, a well organized, systematic, multi-year program had to be established. And so, the macro- (multi-year) meso- (yearly) and micro- (weekly) cycles eventually evolved.

In each year of training, the athlete follows the same general training pattern, but with variations in the exercises, exercise regimes, etc. This kind of training eventually leads to the Olympic level after 5-20 years of training depending on age, level of preparation, when training was first begun and athletic potential. For example, according to Filin and Portnoi (3) the training of the decathlete is broken down into 3 stages. In Stage I, (10-13 years of age), the athletes acquire all-round physical preparation with emphasis on agility, flexibility, and speed. Basic technique in all the events is also mastered. In Stage II, (14-19 years of age), all physical qualities are improved, and technique of all events is mastered. Competition begins at age 18. Sports perfection comprises Stage III, (20-30 years of age). This is when individual development of the physical qualities reach their maximums and skills are strengthened even more. This stage is further subdivided into 4 zones; 20-21 years of age, 22-23, 24-27, (the optimal zone for best results), and 28-30. The 3 stages make up a macro-cycle which establishes the overall guidelines for the athlete's future success.

The macro-cycle is divided into meso-cycles, usually 1-3 years in duration. This cycle is often referred to as the yearly training cycle and is very specific in how it is divided into phases. How the yearly plan is developed usually depends upon the sport, the number of

major competitions, level of athletic accomplishment, physical preparedness, and whether it is during an Olympic, post-Olympic, or World Championship year. However, for most athletes, the cycling (how the training is alternated over the course of the year) is designed to produce maximum results (optimum performance) at a specific time corresponding to the time of major competition.

Within the multi-year plan, each yearly plan is designed to raise the athlete's overall performance in several or all areas. For example, if strength and power are qualities to be developed, the individual works in a specifically prescribed plan to produce results set for that year. (His highest achievements may be scheduled for 2-3 years later!) With this newly developed base, he then repeats the same basic yearly plan which should again bring him to his maximal results for that year. If results are not as expected (within a certain range) adjustments are made either at that time or in the next yearly cycle. For example, if there was insufficient power developed, some strength work may be cut back or more speed type exercises added to produce the desired results. Thus, the athlete begins each year of training on the newly developed base and follows the same progression of training to acquire greater physical qualities, as well as the other factors necessary for success in his sport.

Not only are sports results examined, but also variations in the yearly plans are constantly researched. For example, in the training of young throwers (discus, shot, hammer) it was found that in the competitive period (in comparison to the preparatory period) the correlation between throwing results and pure strength decreases, but increases with speed-strength (power). Relationships between each specific throwing event and certain exercises were also established to help guide the coach in planning the training in the different periods. (12)

In addition, the effects of certain yearly training programs on physiological and anatomical functions are studied. For example, Ilmitsky (5) who studied the influence of periodization in the yearly cycles on heart volume, found that in order to have faster development of the heart in young athletes, it is necessary to use high volume loads on all stages of the yearly training cycle.

The yearly training cycle is usually broken down into 4 phases or periods. They are: the general preparatory, the specialized preparatory, (which are sometimes combined into the preparatory period), the competitive, and the post-competitive period, sometimes called the transitional period. For more detail on each of these phases, see "The Soviet Sports Training System: The Yearly Cycle" Vol. 3, No. 6, NSCAJ.

Each of these phases is subdivided into monthly and weekly periods or cycles. The most predominant one, however, is the 6 or 7 day weekly period known as the micro-cycle or small training cycle. The number of days in the weekly micro-cycle is often determined by the rank of the athlete. Top level athletes (Masters of Sport and Class I) usually train 6-7 days per week while lower ranked athletes (Class III) usually train 4 days per week, which is considered minimal for any athlete. Those who train only 4 days may still do supplementary work on the other days. (See, "The Athlete Defined: A Soviet System of Rank" in Vol. 3, No. 4 of the NSCAJ for more information).

Each workout session is alternated with various objectives, physical loads, and active rest taking up to 18-24 and more hours in the cycle. Recent micro-cycles in some sports also include restorative (recuperative) measures to help the athlete do more effective work. For example, Kopysov, et al. (6) developed a weekly training cycle which included  
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10-90 minutes per day of restorative measures (various forms of massage, hydrotherapies, saunas, etc.) in addition to the physical loads (which ranged from 105 to 315 minutes per day). Such a mini-cycle was used very successfully by the Soviet National Junior Weightlifting Team.

For most effective development of the needed physical and mental qualities and improvement in technique, there must be a definite (optimal) frequency of repetition according to the days of the week. For example, according to Ozolin (9) development of flexibility, general endurance (C-R), speed (using sub-maximal intensity), small muscle group strength and mastery of technique, is best accomplished with training every day. Strength of the larger muscles and the display of explosive strength (power) is best improved with training every other day.

Exercises for improving flexibility with the use of weights, acquiring specialized endurance, and mastering technique with great muscular effort should be performed every other day (3 times a week). Exercises for training specialized endurance with competitive intensity (or even exceeding it), for mastering technique with near maximum effort, for maintenance of flexibility and strength at an attained level and for learning tactics, should be performed only twice a week. Finally, workouts for mastering technique with maximum effort, for maintenance of specialized work-ability, active rest, and participation in competition should be conducted one time a week.

For maintenance of general physical preparation, including general endurance, 2 sessions per week are needed. Two workouts per week are also sufficient for maintaining the achieved speed, strength, and flexibility.

These examples show that each physical exercise, and each workout have an effect on the body (in regard to intensity, volume, coordination and psychological stress). In addition, each one has its own optimal repetitive sequence according to the days of the week.

The number and alternation of the repetitions are not iron clad. They can be altered according to the sport and findings from research and actual practice. For example, Maksimenko and Demerkov (7) found that it is possible to work on running speed in the preparatory period of training and not only in

the specialized preparatory and competitive periods, as was previously practiced with young, experienced, and ranked sprinters. The newly developed cycle is as follows:

Mon.—Speed and speed-strength  
Tues.—Strength and speed endurance  
Wed.—Rest  
Thurs.—Speed and speed-endurance  
Fri.—Strength and speed endurance  
Sat.—General physical preparation  
Sun.—Rest

Weekly cycles were also developed for the different ranks while the "old" cycle was still considered good for beginners.

Some weekly cycles are kept very flexible, especially with elite athletes. For example, according to Griva (4) coach of Dainis Kula, one of the top Soviet javelin throwers, they never plan the content and volume of the weekly training load exactly. However, a general outline is done, and then, exact details are filled in, taking into consideration the state of the athlete, his competitive results, and technique errors. An example of his weekly training program is as follows:

Mon.—Technique/Javelin throwing.  
Tues.—Development of physical qualities, generally strength work. Exercises for increasing work-ability also included occasionally.  
Wed.—Technique  
Thurs.—Individualized training. The athlete does what he wants. If he is very tired, he rests.  
Fri.—Development of physical qualities.  
Sat.—Control trainings.  
Sun.—Active rest.

At times, the weekly or monthly cycle can be substantially different from the "theoretical." For example, Alexeev (1) the great Soviet super-heavyweight lifter, had only 14 actual training days in the month prior to the World Championships in 1974. This now appears to be typical for top Soviet weightlifters as they want a day's rest between workouts. However, the content is varied according to the athlete and the number of days prior to competition. During the competitive phase, Medvedev (8) determined that in the last four weeks before a meet the lifter should execute each exercise 6-8 sets. The number of repetitions per set in snatch and clean, and jerk exercises should be 3-4, with weights that are 60-80% of max and 1-2 reps with 85-100% weights. For pulls, 2-4 reps per set; for pushjerks behind the neck, snatch grip, 2-3 reps; plus 1-2 squats, and so on. For more detailed information on precise weekly, month-

ly, and year round programs for variously ranked lifters, see the last few year's editions of the *Soviet Sports Review*.

Depending upon the sport, one can also find 3 week cycles. These are usually devoted to the development of specialized physical qualities such as specialized endurance for "short" distance runners. After such a cycle, there is a week of restoration along with high intensity training.

Microcycles are usually repeated 3-4 times. The daily training regime remains the same each week. This is done to allow for bodily adaptation, but because of the short duration, not to allow for staleness to set in. However, the training load increases for 2 weeks and is then decreased in the 3rd week. This general schematic is used because the Soviets have found that optimal development in most exercises occurs in 3-4 weeks, after which the exercise must be varied to get additional gains. This applies to high level, ranked athletes only.

There is also a definite sequence of training in each workout session. The first exercises to be done are usually those devoted to the development of speed or mastering technique. These exercises are then followed by exercises for developing strength and endurance. The overall physical load in the workouts usually changes from day to day and forms a double wave when charted. The physical loads increase in the first three days and then decrease on the fourth day. Depending upon the stage of training and the condition of the athlete, the fourth day may be a day of active rest (some light activity and usually a different sport). The physical loads then increase for 2 days and are followed by a day of decreased loads, or the athlete has a day off for complete rest.

For women athletes, especially those who use high intensity and high volume loads, the weekly and monthly cycles are adjusted according to their menstrual periods. During the days of menstruation, the volume of exercises decreases, and intensity drops to 50-60% of maximum. Exercises for strength and jumpability are excluded, especially static type exercises. Many senior women athletes participate in competition during the menstrual period to prepare themselves for such an eventuality during a major meet.

At this point it should be re-emphasized that there are substantial differences in the weekly micro-cycles between high ranked (Masters of Sport and Candidates for Masters of Sport) and lower

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ranked athletes. According to Bondarchuk (12) when discussing the weekly cycles of hammer throwers, "Lower-ranking athletes improve their performance primarily by means of improving their basic motor qualities by means of throwing implements of different weights, and by increasing the level of their general fitness." With lower-ranked athletes, there is not a big difference between individual workouts. The athletes throw the hammer, execute barbell exercises, and do standing jumps, etc., in one workout, and the number of workouts per week ranges from 3-5. Weekly cycles for high-ranking athletes are different. The number of workouts is significantly greater (up to 12) and the number of rest days is reduced sharply. According to Bondarchuk, "there is a certain standardization of the weekly cycle. Throwing workouts are alternated with barbell workouts. This is important because it increases one's performances and accelerates the recovery processes. Also, the number of training modes is reduced significantly (only the most specific are retained), and performance improvement is brought about primarily by means of specialized training."

The intensity of the training loads in the weekly cycle is medium to maximum for high ranked athletes during the specialized preparatory and competitive periods. However, low-intensity work is used for doing special warm-ups and for stimulation of the recovery processes. In some instances, the amount of low-intensity work even increases during the competitive period as in the case of Alexeev's program which was mentioned earlier.

For specific examples of microcycles in track and field and other sports, see the *Soviet Sports Review*. Examples can be found of many general, specialized and competitive period microcycles. Also, many more examples of microcycles will be appearing in future issues.

In the last few years there have been a few innovations which have changed the make-up of the weekly cycle quite dramatically. In working with elite T & F athletes, Verkhoshansky (10) has determined that "concentrated" loads produce better results than "distributed" loads. In concentrated loads the athlete works solely on one physical quality (such as strength) with high volume, high intensity loads. He then ceases such strength work but the strength gained remains for 2-3 months as the athlete develops greater speed-strength (pow-

er). In other words, there is a "delayed training effect." It is during this period that the athlete does technique work (in relation to his newly acquired strength), participates in competition and in general, does specialized work of moderate volume but with a higher power output. Doing distributed-load work is still effective but for lower ranked athletes.

In addition, Verkhoshansky (11) has found that using microcycles that have physical loads of one primary direction during the specialized preparatory period produces a greater training effect. In other words, working on only one physical quality produces better results than using the multi-method of training (working on several physical qualities in the microcycle). This is only true with high level athletes and only when doing specialized work on one physical quality.

Sometimes this method is called the linked-successive system in planning the cycles. There is a definite order and periodicity to when different training volume loads, having different purposes, are brought into the workouts. This is done so that there is a systematic increase in the specific training effect on the body. In other words, after going through a cycle of a particular microcycle, the body is left in a certain state (condition). This creates a favorable background for increasing the training effect of the following physical loads. Each cycle then leaves the body in a state where it can cope with the new workouts of the next cycle. All of this is done in a prescribed succession of events which produces maximal results.

In conclusion, it can be said that the microcycles are the key element in having successful yearly and multiyear training programs. What the athlete does in each workout plays a very important role. For maximum success, the weekly workouts are well planned and developed having a definite continuity and sequence of effects. Each microcycle is individually prescribed and adjusted according to athletic rank, physical preparation, level of training and so on. In addition, the microcycles are constantly evaluated and updated to bring about maximum development of the athlete. ©

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