

Annual Planning, Periodisation and its Variations

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The annual plan is often viewed as the most important tool for the coach to guide athletes' training over a year. Such a plan is based on the concept of periodisation, which has to be viewed as an important concept to follow if one intends to maximise his athlete's performance.

The main objective of training is to reach the highest level of performance at the time of the main regatta of the year. But in order to achieve such a task one has to carefully plan the main activities of a crew, to create the best training menu, and to periodise the dominant abilities such as endurance and strength in such a way that will result in the highest probability of meeting the annual training goals.

Considering the above goals, and the high level of knowledge of my audience, I will be focusing in this presentation mostly on the concept of periodisation and its variations.

Periodisation

Periodisation is a process of dividing the annual plan into small phases of training in order to allow a program to be set into more manageable segments and to ensure a correct peaking for the main regatta of the year. Such a partition enhances a correct organisation of training, allowing the coach to conduct his program in a systematic manner.

In rowing, the annual training cycle is conventionally divided into three main phases of training: preparatory, competitive and transition. Both the preparatory and the competitive phases are also divided into subphases since their tasks are quite different. The preparatory phase, on the basis of different characteristics of training, has both a general and a specific subphase, while the competitive phase usually is preceded by a short pre-competitive subphase. Furthermore, each phase is composed of macro- and micro-cycles. Each of these smaller cycles has specific objectives, which are derived from the general objectives of the annual plan.

High levels of athletic performance are dependent upon the organism's adaptation, psychological adjustment to the specifics of training and competitions and the development of skills and abilities. On the basis of these realities, the duration of training phases depends heavily on the time needed to increase the degree of training and to reach the highest training peak. The main criterion for calculating the duration of each phase of training is the competition calendar.

The athlete trains for the competition for many months aiming at reaching his highest level of athletic shape on those dates. The accomplishment of such a goal assures very organised and well-planned annual training, which should facilitate

psychological alterations. Organisation of an annual plan is enhanced by the periodisation of training and the sequential approach in the development of athletic shape.

The needs for different phases of training were inflicted by physiology because the development and perfection of neuro-muscular and cardio-respiratory functions, to mention just a few, are achieved progressively over a long period of time. One also has to consider the athlete's physiological and psychological potential, and that athletic shape cannot be maintained throughout the year at a high level. This difficulty is further pronounced by the athlete's individual particularities, psycho-physiological abilities, diet, regeneration and the like.

Climatic conditions and the seasons also play a determinant role in the needs of periodising the training process. Often, the duration of a phase of training depends strictly on the climatic conditions. Seasonal sports, like rowing, are very much restricted by the climate of a country.

As the reader may be aware, each competition and, for that matter, the highly challenging training that is specific to the competitive phase, has a strong component of stress. Although most athletes and coaches may cope with stress, a phase of stressful activities should not be very long. There is a high need in training to alternate phases of stressful activities with periods of recovery and regeneration, during which the rowers are exposed to much less pressure.

Periodisation of Biomotor Abilities

The use of the concept of periodisation is not limited to the structure of a training plan or the type of training to be employed in a given training phase. On the contrary, this concept should also have a large application in the methodology of developing the dominant abilities in rowing (endurance and strength).

Figure 1: The Periodisation of Dominant Abilities in Rowing

	Preparatory		Competitive			Transit
	General Preparation	Specific Preparation	Pre-Competition	Main Competition	Transit	
Strength	Anatomical Adaptation	Max strength	Conversion to Musc. End.	Main-tenance	Chps	Rehab.
Endurance	Aerobic Endurance	Development of Foundation of Specific Endurance		Specific Endurance		Aerobic Endurance

Periodisation of Strength Training

The objectives, content and methods of a strength training program change throughout the training phases of an annual plan. Such changes occur in order to reflect the type of strength rowing requires muscular endurance (the capacity to perform many repetitions against the water resistance).

The Anatomical Adaptation - Following a transitional phase, when in most cases athletes do not particularly do much strength training, it is scientifically and methodically sound to commence with a strength program. Thus, the main objective of this phase is to involve most muscle groups to prepare the muscles, ligaments, tendons, and joints, to endure the following long and strenuous phases of training. A general strength program with many exercises (9-12), performed comfortably, without "pushing" the athlete, is desirable. A load of 40-60% of maximum, 8-12 repetitions, in 3-4 sets, performed at a low to medium rate, with a rest interval of 1-1:30 minutes between exercises, over 4-6 weeks will facilitate to achieve the objectives set for this first phase. Certainly, longer anatomical adaptation (8-12 weeks) should be considered for junior athletes and for those without a strong background in strength training.

The Maximum Strength Phase - Ever since it was found that the ergogenesis of rowing is 83% aerobic and 17% anaerobic, the importance of strength has diminished in the mind of many coaches. In addition, the rowing ergometer has captivated the attention of most coaches. Often the rowing ergometer is used at the expense of strength training.

All these changes in training philosophy favoured the development of aerobic endurance to high levels. The results were to be expected: rowing races were never faster than now. However, what coaches should observe in the future is that to spend the same amount of time for the further development of aerobic endurance might not result in proportional increases in performance. One should analyse whether or not his athlete has maximised his endurance potential? Or, is there anything else which could improve the rower's performance?

In our estimation now is the time to add a new ingredient to the traditional training menu: maximum strength (which is defined as the highest load an athlete can lift in one attempt). This shouldn't frighten anybody! Nobody proposes to transform the rowers into weightlifters! As illustrated by the following figures, maximum strength has to be developed only during certain training phases of the annual plan.

Why train maximum strength anyway? A simplified equation of fluid mechanics will demonstrate this point: $D \sim V^2$

That is that drag (D) is proportional to the square of velocity (V^2).

Assuming that a coach has concluded that endurance has been developed to very high levels, spending more time on it might not bring superior performance. He might decide that in order to cover the 2,000m in superior speed the rowers have to increase the force of blade drive through the water (say by an average of 2 kg per stroke). But, according to the above equation for any additional force pulled at the oar handle, drag (water resistance) will increase by the square of blade's velocity. If one pulls against the oar handle with an additional 2kg (our example), according

to the above equation, drag increases by 8kg! Therefore, the need to increase the level of strength has been demonstrated.

The duration of the maximum strength phase could be between 2-3 months, depending on the rower's level of performance and his needs. The suggested load could be between 70-90% of maximum, performed in 3-6 sets of 3-8 repetitions with a rest interval of 3-4 minutes.

The Conversion Phase - Gains in maximum strength have to be converted into muscular endurance; this type of strength is dominant in rowing. During these 2-4 months, the rower will be exposed to a training program through which progressively he will be able to perform tens, and even hundreds, of repetitions against a standard load (40-50%) in 2-4 sets.

The Maintenance Stage - Strength training must be maintained through some forms of land training, otherwise detraining will occur, and the benefits of maximum strength, and especially muscular endurance, will fade away progressively. And, rather than being used as a training ingredient for superior performance at the time of the main regatta, the reversal of such gains will decrease the probability of having a fast race.

A training program dedicated to the maintenance of strength will address the weakest link in the area of strength. It could be organised 2-3 times per week, following water training and could consist of either elements of maximum strength, muscular endurance or a given ratio between the two. In either case it has to be of short duration and planned in such a way as to avoid to unrealistically tax athlete's energy stores. Certainly, exhaustion is not a desirable athletic state.

The Cessation Phase - Prior (5-7 days) to the main competition of the year, the strength training program is ended, so that all energies are saved for the accomplishment of a good performance.

The Rehabilitation Phase completes the annual plan and coincides with the transition phase from the present to the next annual plan. While the objectives of the transition phase are through active rest, to remove the fatigue and replenish the exhausted energies, the goals of rehabilitation are more complex. For the injured athlete, this phase of relaxation also means to rehabilitate, and restore injured muscles, tendons, muscle attachments, and joints, and should be performed by specialised personnel. Whether parallel with the rehabilitation of injuries, or afterwards, before this phase ends all the athletes should follow a program to strengthen the stabilisers, the muscles which through a static contraction secures a limb against the pull of the contracting muscles. Neglecting the development of stabilisers, whether during the early development of an athlete or during his peak years of activity, means to have an injury prone individual, whose level of maximum strength and muscular endurance could be inhibited by weak stabilisers. Therefore, the time invested on strengthening these important muscles means a higher probability of having injury free athletes for the next season.

Periodisation of Endurance

During an annual plan of training, the development of endurance is achieved in several phases. Considering, as a reference, an annual plan with one main regatta (Olympic Games), endurance training is accomplished in three main phases: 1) aerobic endurance, 2) develop the foundation of specific endurance, and 3) specific endurance.

Each of the suggested phases has its own training objectives:

1. Aerobic endurance is developed throughout the transition and the long preparatory period (4-6 months). The main scope of the development of aerobic endurance is to build the endurance foundation for the regatta season and to increase to the highest level possible the rowers' working capacity (the cardio-respiratory system). The whole program has to be based on a high volume of training (20-28 hours per week).
2. The development of the foundation for specific endurance has an extremely important role in achieving the objectives set for endurance training. Throughout this phase, a representation of the transition from aerobic endurance to an endurance program has to mirror the ergogenesis of rowing (the aerobic-anaerobic ration expressed in percentage). Some elements of anaerobic training are introduced, although the dominant training methods are: uniform, alternative, long, and medium distance interval training (2-5 km).
3. Specific endurance coincides with the regatta season. The selection of appropriate methods should reflect the ergogenesis of rowing, its ratio being calculated per week (3-5% anaerobic alactic, 8-12% anaerobic lactic, and the balance aerobic endurance). The alteration of various types of intensities should facilitate a good recovery between training sessions, thus leading to a good peak for the final competition.

Variations of Periodisation

Figure 2 attempts to illustrate the periodisation of dominant abilities in rowing with the goal of peaking for the Olympic Regatta. This attempt is an adaptation of figure 1, but at this time it considers the time factor.

Figure 2: A Suggested Periodisation of Dominant Abilities for Rowing in 1992

1991			1992								
Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
Preparatory						Competition			Transition		
Anatomical Adaptation		Maximum Strength	Conversion to Muscular Endurance				Main-tenance	Chps	Off		Rehab
Aerobic Endurance						Found Specific Endurance	Specific Endurance			Off	Aerobic Endurance

Assuming that the coach may decide that in order to take his athletes to higher levels of performance, additional strength is desirable. In such a case a variation of the standard periodisation (figure 2) is suggested by figure 3.

In order to achieve this goal, two phases of maximum strength of six weeks each are proposed (total 12 weeks), each of them being followed by phases of muscular endurance so necessary in rowing (a total of 14 weeks). Such an approach is more desirable for elite athletes with very high endurance capabilities, whose progress in the past two years did not materialise. It is expected that this novelty in periodisation will bring the additional ingredient for a higher step in athletic proficiency.

Figure 3: A Suggested Variation of Periodisation for Rowing

1991			1992								
Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
Preparatory						Competition			Transition		
Anatomical Adaptation	Maximum Strength	Conversion to Muscular Endurance	Maximum Strength	Conversion to Muscular Endurance	Maintenance	Chps	Off	Rehab			
Aerobic Endurance						Found Specific Endurance	Specific Endurance			Off	Aerobic Endurance

In many walks of life improvements were often the result of challenging the tradition. It is expected that variations of periodisation signify such a challenge.