Quadrennial and Double Quadrennial Planning of Athletic Training

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During the 1960's and early 70's, it became apparent that long-range planning of athletic performance was a pre-condition to the achievement of international sporting success. Studies done by the Soviets and East Germans underlined the importance of annual and quadrennial planning and this greatly contributed to the theory of training - especially with the introduction of the concept of multiple periodization.

Since it takes 6 to 8 years (and often more) of training to produce elite athletes, a well-established and monitored training plan must be in place early to best develop an individual's competitive talents.

Due to the efforts of Sport Canada and the Canadian Coaching Association, quadrennial planning has become an integral part of Canadian amateur sports. However, in order to optimize athletic preparation, the coach must look beyond quadrennial planning. This article provides some insight into the type of strategies which are available to coaches and athletes; it also shows how long-range planning can be used to optimize training and performance.

The principles outlined in this article constitute the basic elements of the Canadian Men's Alpine Ski team program for the 1988,1992, and 1994 Winter Olympics. However, this does not mean that these principles can't be applied to a wider segment of the population. With the growth of interest in sports competition, more and more athletes need to educate themselves concerning their long-range development.

Without a well-designed blueprint to work from, the serious athlete is left to meander his way towards performance - a hit-or-miss approach that is just too expensive to maintain. Periodization of an annual plan is the means of integrating the various sport sciences (i.e. - exercise physiology, biomechanics, psychology, nutrition, etc.) and practical coaching experiences into an overall plan. This is done in order to maximize athletic preparation either for individual athletes or teams.

Figure (1) illustrates the general trends of an annual plan and consists of four major periods (general, specific, competitive and transition). Although there are specific objectives for each period, the volume and intensity of training is keyed to performance ('peaking') during the competitive period. The volume of load refers to the quantity of training while the intensity of the load refers to quality. To achieve proper training effects in early season, the volume must be high and the intensity low; in order to achieve peak performances later in the season, low volume and high intensity must characterize that period. Both volume and intensity are guided by the principle of progressive overloading.

However, since the five factors of performance (stamina, strength, speed, skill and suppleness) cannot be trained simultaneously, an optimum distribution of training for each of the '5 S's' must be worked out in a long-range plan - taking into

consideration individual needs and demands. The main objective of the first few years is "training to train", a plan designed to provide a foundation for higher levels of training and future competition (contrary to present coaching practices).

Figure 1.

In order to provide optimum preparation for beginners and developing athletes, single periodization of the annual plan is the most suitable. This means that an athlete will have only one competitive period within each annual plan. There can be one or two major peaks within that period (FIGURE 1 illustrates a competitive period with two peaks). However, in the case of beginners, there will be no actual competition, but rather specific training under competitive conditions (model training).

Double periodization refers to an annual cycle with two competitive periods. In sports where specific skills play an important role in performance (e.g., alpine skiing, gymnastics, the throwing and jumping events of track and field) it is necessary to provide high level sport-specific technical training. Factors such as power, speed, and skill must be integrated through the process of taper and peak - this is done in order to develop sport-specific skills under optimum circumstances.

Figure 2 illustrates the basics of a double periodization program. After initial general and specific training periods are completed, two competitive periods are scheduled with further specific training periods in between. Very often, Competitive Period One is not a full peak - it is usually a minor peak or a “stimulated” physiological-technical peak without competition.

Double periodization provides the framework for well-conditioned intermediate athletes to do more technical work under controlled, sport-specific competitive or simulated competitive conditions. For example, indoor track meets offer jumpers and sprinters winter races to hone technical skills for the more important summer season. National ski teams use simulated dry-land physiological peaks for laboratory testing during the summer in order to maximize physical conditioning for World Cup races later in the year.

There is another benefit to the double periodization program. The identification of weaknesses during the first competitive period helps the coach to provide optimum intervention during the second specific period - which maximizes the effects of training for high level performances during the second competitive period.

After being specifically trained for 6 to 8 years, it would be a waste of time and energy to return to basic conditioning at the beginning of each annual cycle, since maintenance training takes care of sport-specific, general physical conditioning.

For the athlete who has undergone several years of specific training, and has reached a high level of fitness, general training loads will not provide further adaptation. Therefore, a high intensity and sport-specific training must be organized for the annual cycle.
Figure 3 outlines multiple periodization for advanced athletic training.

As can be seen in Figure 3, volume is relatively high for the whole cycle. Because of the high volume and intensity of training, more frequent recovery cycles and prophylactic breaks are utilized.

Frequent model training (practice of the sport in competition-specific conditions) is also utilized to provide maximum adaptation concerning technical precision, individualized recovery and an individualized tapering and peaking procedure.

The following schema (Fig 4) illustrates the integration of single, double and multiple periodization into a double and quadrennial plan.

Figure 4.
Using the Men’s Ski Team as an example, now examine the integration of a double quadrennial plan. Four single, periodized annual cycles were designed initially to provide an optimum foundation for athletic preparation during the first quadrennial plan. (1984-1988). Two double periodized cycles will follow, (‘88-90) providing a higher level of sport-specific technical and tactical “basics”.

Two multiple periodized annual cycles will then be introduced to provide the highest level of physio-psychological adaptation (‘90-’92).

Figure 5 illustrates and summarizes the basic trends of a double quadrennial plan.

Double quadrennial plan with annual details (fig 5)

G  General phase of training
S  Specific phase of training
PC  Pre-competitive phase of training
C  Competitive phase of training
T  Transition
P  Prophylactic break
T+P  Transition and Prophylactic break
Years 1-2-3
   Establishment (Training to train) (Foundation)

Year 4
   Integration-stabilization (training to compete)

Years 5-6
   High intensity double periodization
   Emphasis on taper and peaking

Years 7-8
   High intensity multiple periodization
   Emphasis on final tuning-stablizing taper and peak

Year 7
   Olympic Model training

Year 8
   Final Olympic Preparation

*Note. the general trends of shorter general training cycles and longer specific, pre-competitive and competitive cycles - these are the trends of macro tapering.

At present, it appears that multiple periodization is of primary benefit to international calibre athletes, and that double periodization is satisfactory for lower levels of competition. It is important for coaches to remember that the introduction of double or multiple periodization means an increased training load for the athlete, and that the use of double or multiple periodization can be detrimental unless athletes are at a stage in their development where they can recover adequately from those training loads.

In fact, only the best athletes will reach a level at which multiple periodization is beneficial. However, looking forward to the 1990's, it seems that this model (and its corollaries) will be a pre-requisite for long-range planning at the elite level.